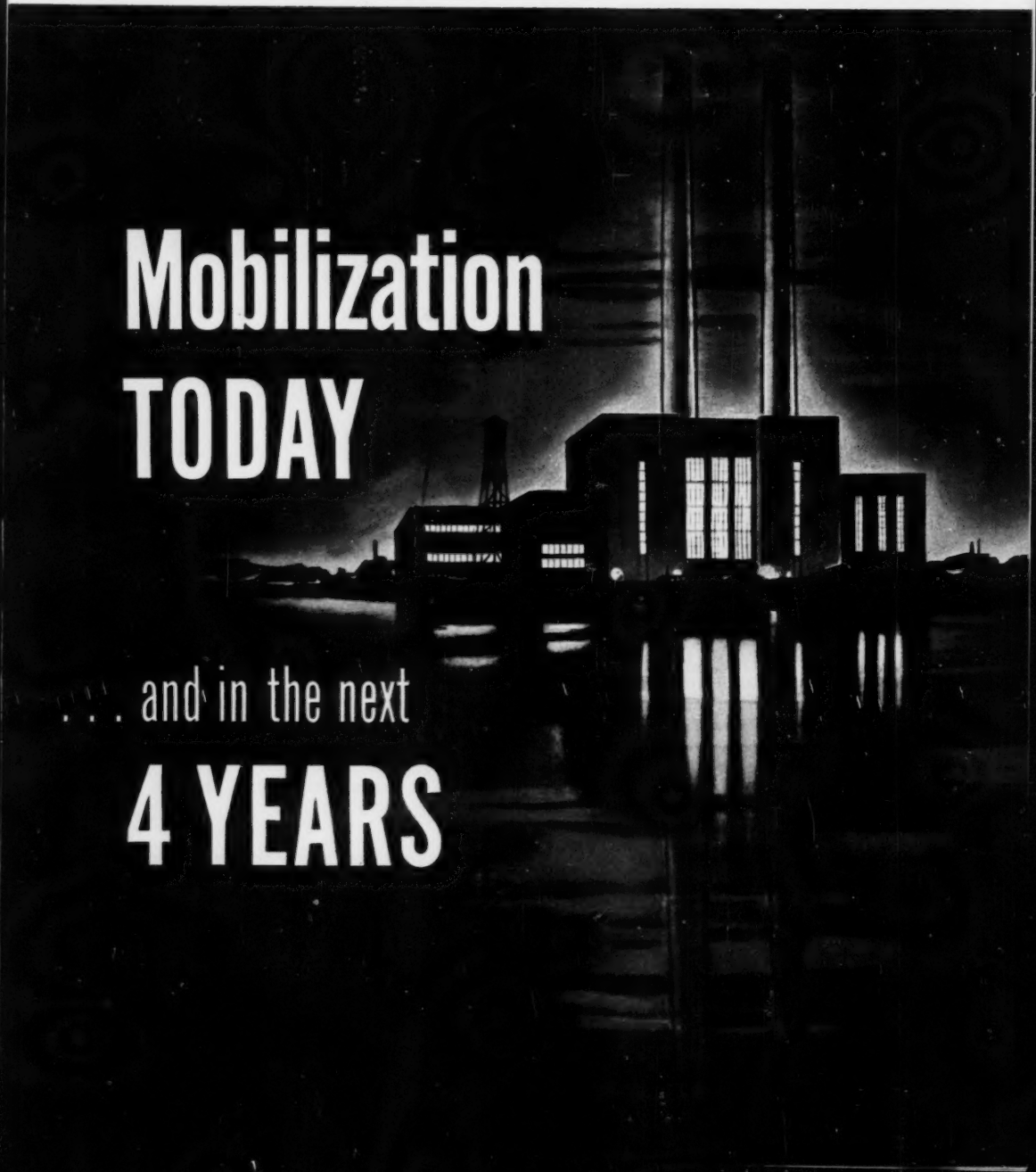
MAY 21, 1951

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION



KEEP YOUR TURBINES

RUST-FREE SLUDGE-FREE FOAM-FREE

with TEXACO REGAL OILS (R&O)

Today's demand for greater production underscores the need for keeping your turbines on the line. *Texaco Regal Oils (R & O)* can help you do it. They are *more than ten times as resistant to oxidation* as other turbine oils and give superior protection against rust and foam.

For decades before advances in turbine design made additive oils necessary, *Texaco Regal Oils* were world-famous turbine lubricants. *Texaco Regal Oils (R & O)* are these same fine oils *improved* by special inhibitors and processing designed to keep turbine systems free of rust, sludge and foam.

You'll get extra-long service life from *Texaco Regal Oils (R & O)* . . . and extra protection for your turbines. Oil lines will remain open, bearing temperatures normal, governor response instantaneous.

Texaco Regal Oils (R & O) meet the stringent requirements of all leading turbine builders. A Texaco Lubrication Engineer will gladly tell you about them in detail. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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TEXACO Regal Oils (R&O)

FOR ALL TURBINES

TUNE IN . . . TEXACO STAR THEATER starring **MILTON BERLE** on television every Tuesday night. See newspaper for time and station.

THE NEXT FOUR YEARS

"—by 1953, the total value of goods and services produced (gross national product) is likely to reach $340 billion per year (365 billion if we make allowances for price inflation).

"There are, of course, limits on our ability to produce; the number of people who can be drawn into the labor force, the hours they will work, and the effectiveness of the average worker. But in an emergency these limits are much more flexible than in normal times. More people will work longer hours, and the total national product can be rapidly increased."

Those two paragraphs are lifted from a manuscript prepared by the McGraw-Hill Department of Economics for this issue of Electrical World. It deals with what everyone knows is the biggest question facing the electric power industry: How will the coming four years of defense economy affect the electric utilities as to manpower, maintenance, operations, and the expansion program?

We've gone to considerable trouble to try to find the answers. Every field editor has mailed carefully prepared questionnaires to utilities in his territory and he has backed this up with personal calls on utility executives. And in New York we've held sessions with research men from the nation's foremost manufacturing and utility firms.

It all stems from our firm belief that a business paper really doing its job will devote all its resources to the effort of finding the answers to the most significant and pressing problem of the day.

Last year Electrical World published "Blueprinting the Future"—a careful analysis of the coming fifteen years, designed to aid the industry in its long-range planning.

From the thousands of reprints requested, and the fact that several big manufacturers have told us that they used its figures to reschedule production plans, it was a useful editorial effort.

Now, the entire economic horizon has changed, and we must readjust our thinking and planning to the immediate, rather than the coming decade or so.

Thus, we present **The Next Four Years.** We think you'll find it immensely useful—and we'd like to hear your comments.

THE EDITORS

Electrical World

Published for 77 years for those engaged in the business of generating, transmitting, distributing or applying electric power

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TRANSMISSION TOWERS

HUGHES BROTHERS developed and pioneered "X-Braced" construction, worked out the structural theory, and confirmed it by full-sized tests. The results: Thoroughly reliable transmission systems, and savings of millions of dollars for the electric utility industry.

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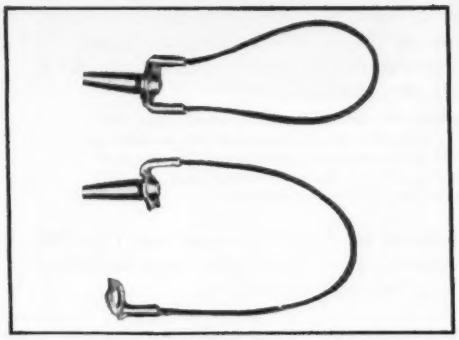
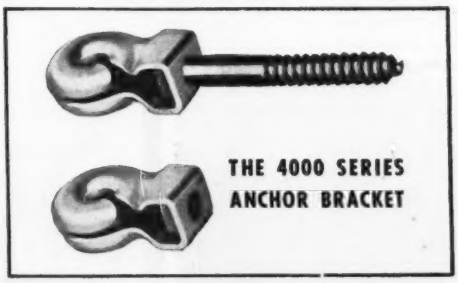
BROTHERS NEBRASKA
INCORPORATED

Electroline AUTOMATIC DEAD-END

for Neutral Supported Multiple Conductor Service-Drop Cable





THE 4000 SERIES ANCHOR BRACKET

This Electroline Automatic Dead-End is designed for use with neutral-supported type of service drop. The insulation on the phase wires is not destroyed because these Dead-Ends grip only the bare neutral. This eliminates the possibility of shorting any phase. Available only for No. 6-AWG conductor. For automatic line Dead-Ends use the Electroline 3400 Series.

THE ELECTROLINE 3800 SERIES Automatic Dead-Ends lower construction costs because they are easily installed in a few seconds. This Dead-End is assembled as a one-piece unit with no loose parts to be dropped or lost. One end of the flexible bail is detachable for use with a spool-type insulator or other types of supporting anchorages now in service. This feature permits quick and easy installation with only one part, other than the conductor, to be handled by the lineman.

ELECTROLINE 4000 ANCHOR BRACKET — The 4000 Series Service Bracket, for use on permanently multi-grounded neutral systems (ideal for use with 3800 Series Dead-Ends as illustrated below), permits quick and simple insertion of a closed bail or loop—supports the cable at any angle. Installation costs are further reduced since this method of anchoring eliminates the insulator and insulator hardware.

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TOTALLY ENCLOSED 22 KV

Supplant Conventional Open Designs on Duquesne Light Company Systems

Duquesne Light Company for many years urged the development of an arc-free air switch that could be metal-clad, yet capable of interrupting load and charging currents at 22 KV.

Such a switch was needed for their 22 KV loop and double tap systems to permit the total enclosure of unit substations, successive steps towards which had been taken in recent years, as pictured here, by enclosing the secondary switchgear and by placing underground the secondary, then the primary connections. All that remained exposed was the primary switchgear.

Following the S&C development of 23- and 34.5-KV interrupter switches, the metal-clad switchgear unit shown on the right was designed jointly by Duquesne Light Company and S&C. The result is the totally-enclosed 2000 KVA unit substations shown below, on which they comment:

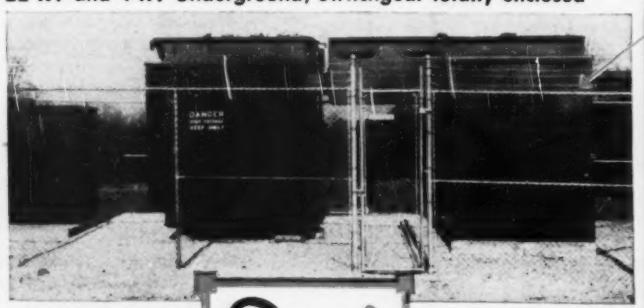
> **"It was found . . . because of the proximity of various hazards, small sites, and safety against external interference . . . that the totally enclosed job permits a satisfactory and safe installation that might have to be located elsewhere if these features had not been developed. In fact, the totally enclosed job will be used in all future installations with few, if any, exceptions."**

S&C Metal-Enclosed Switchgear, using Alduti Interrupter Switches and Type SM Power Fuses, probably offers many advantages for your system also, including low original and maintenance costs. Your inquiry is invited.

The details of Duquesne Light Company's unit substation program are presented in a paper entitled "The Application of Unit Substations" by W. P. Holben and G. N. Hoffman. Copies will be sent on request.

1950

22 KV and 4 KV Underground; switchgear totally enclosed

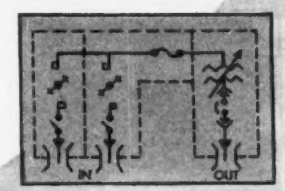


19

S&C ELECTRIC

Formerly SCHWEITZER & CONRAD, INC.

SUBSTATIONS



1947
22 KV and 4 KV Overhead

1948
22 KV Overhead, 4 KV Underground

1949
22 KV and 4 KV Underground

1950
22 KV and 4 KV Underground; switchgear totally enclosed

50

COMPANY

4421 Ravenswood Avenue
Chicago 40, Illinois, U. S. A.

In Canada, Powerlite Devices, Limited, Toronto

WEST-COAST UTILITY *reports:*

TROUBLE-FREE SERVICE

FROM ITS C-D CAPACITOR INSTALLATIONS
TOTALLING OVER 155,250 KVAR

Here's another verified C-D field performance record. A large western utility ordered its first C-D capacitors for power-factor improvement back in 1938, and followed this up with many additional C-D installations, totalling over 155,250 Kvar. This utility now reports that these C-D units have given trouble-free service in the field, year after year, with little or no maintenance required. A real tribute to the rugged, money-saving dependability of C-D capacitors!

HERE'S HOW DEPENDABLE SERVICE IS BUILT INTO C-D CAPACITORS:

- Lowest dielectric unit stress
- Highest major insulation level
- Case SAND-BLASTED before spraying, for longer-lasting finish
- Dykanol-filled bushing increases accepted flash-over safety factor
- Lowest volt-amperes per square inch of radiating surface
- Removable solderless connectors
- Many small sections; extremely low voltage gradient per section
- Impregnated and submerged in non-inflammable, non-explosive Dykanol. Results in lower unit weight per Kvar; high stability and longer life

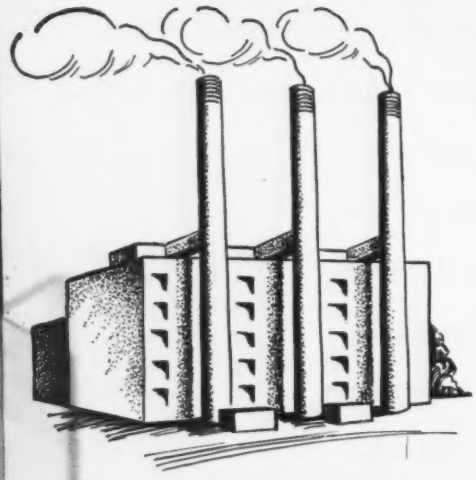
A C-D field engineer will be glad to discuss your power-factor capacitor requirements. Write today for catalog of C-D industrial, station and pole-type capacitors. Cornell-Dubilier Electric Corp., Dept. D-51, South Plainfield, N. J.

CONSISTENTLY DEPENDABLE

CORNELL-DUBILIER CAPACITORS

PLANTS IN: SOUTH PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER, CAMBRIDGE, MASS.; PROVIDENCE, R. I.; INDIANAPOLIS, IND.; FUQUAY SPRINGS, N. C. AND SUBSIDIARY: THE RADIART CORP., CLEVELAND, OHIO

It Takes POWER



THE JONESES, USA, are a fast moving set. They're spending more than ever before for defense and in addition they're spending for home freezers, refrigerators, and television sets. It all adds up to bigger power loads to come.

The electric utility industry is doing a tremendous job in keeping up with the Joneses. Utilities all over the country have taken the initiative and are expanding or planning to expand. Many are getting help from Allis-Chalmers.

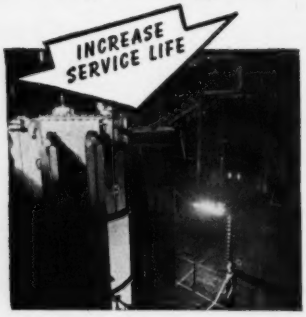
While plans are still in the formative stage, it might pay you too to take advantage of the wealth of experience of your Allis-Chalmers representative. He not only has a wide line of equipment for the electric power industry, but he has a broad background of practical experience that could prove helpful to you. Call your nearby Allis-Chalmers District Office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3368

It Pays to Keep Pace with Machinery Progress

PREVENT SCALE in your coolant cycle; cut maintenance costs. This modern 57,000 gallon capacity zeolite water conditioner helps guard against scale, foaming, and carry-over, as well as against corrosion and expensive blowdown.

TUBE-TYPE totally-enclosed fan-cooled motor shown above rarely if ever needs cleaning. Cooling air passages are straight and unrestricted—there is no place for dirt or moisture to collect. Ideal design for dirty locations, inside or out.

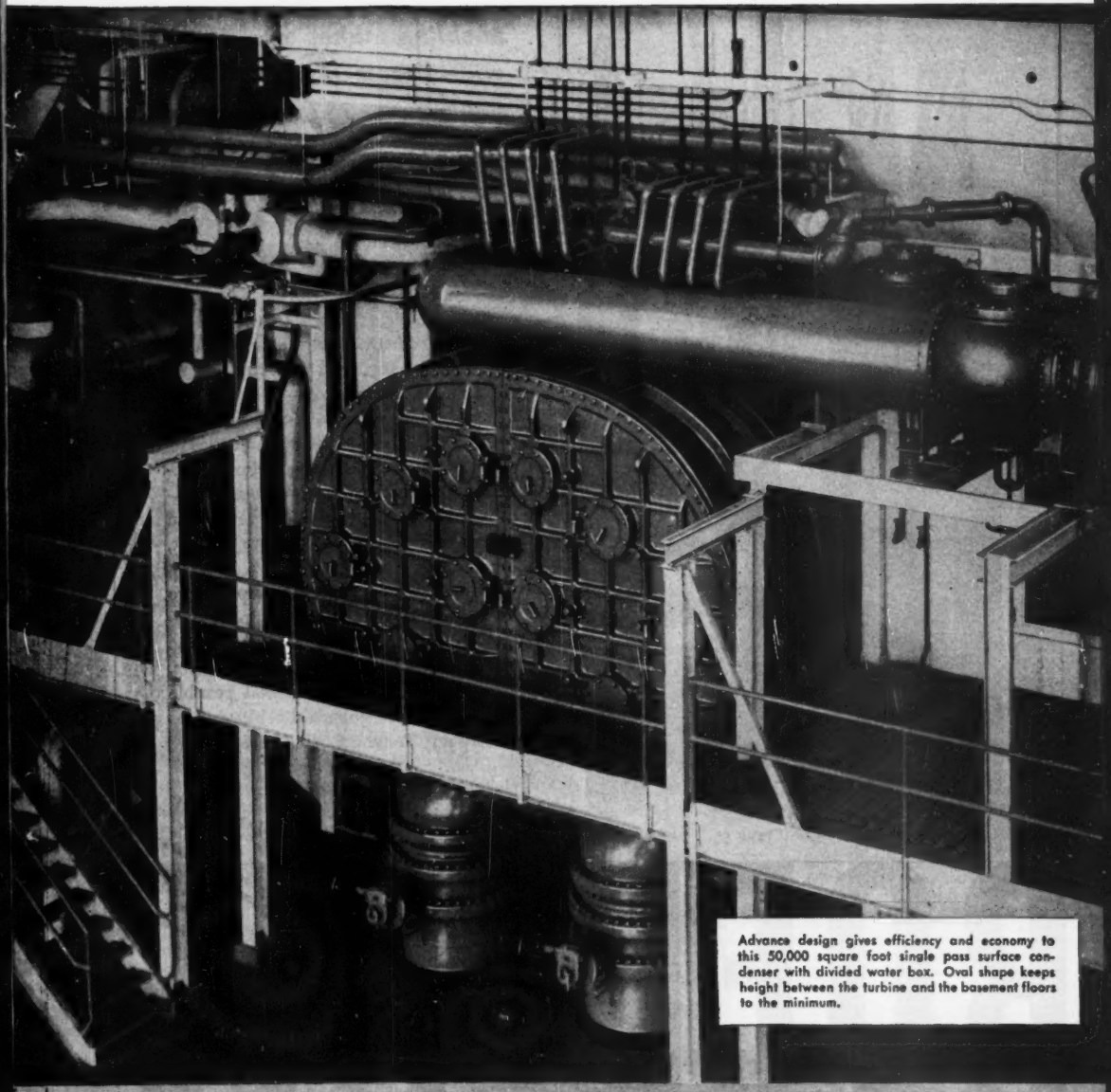


TRANSFORMERS maintain full strength, last for years without deterioration because Allis-Chalmers modern corona-free design completely eliminates effects of corona. 20,000 kva transformer above is being surge-tested in laboratory.

Equipment for Power: Water Conditioning equipment, chemicals and service... Steam and Hydraulic Turbines... Generators... Condensers . . . Steam Jet Air Ejectors . . . Power Plant Pumps and Motors . . . Transformers... Circuit Breakers... Switchboards and Control . . . Switchgear . . . Unit Substations . . . Utilization equipment.

ALLIS-

To Keep Up With The Joneses!

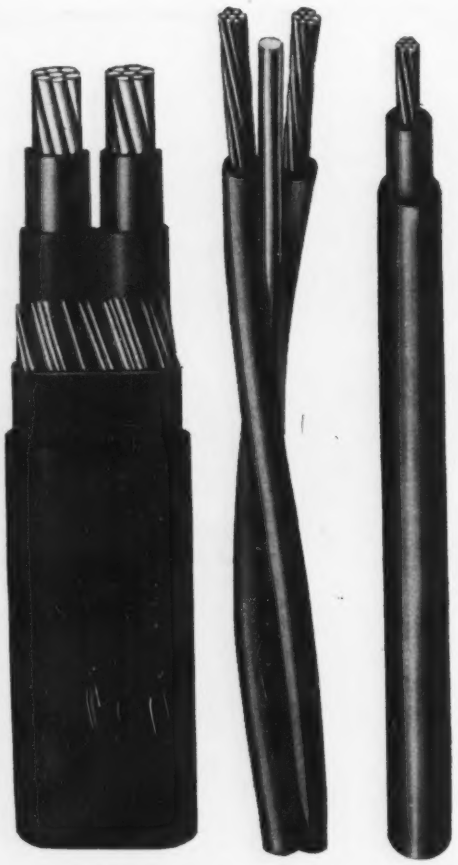


Advance design gives efficiency and economy to this 50,000 square foot single pass surface condenser with divided water box. Oval shape keeps height between the turbine and the basement floors to the minimum.

CHALMERS

A-C ALLIS-CHALMERS

SERVICE ENTRANCE CABLES



TYPE SE TYPE SS TYPE USE

Roebling makes a wide line of service entrance and service drop cables

SERVICE CABLES are an important part of Roebling's complete line of electrical wires and cables. Whatever your requirements for getting electrical energy from the utility's secondary to the meter, the right Roebling underground or overhead cable will give you the fullest measures of dependability...and economy.

All types and styles of Roebling Service Entrance Cable are made in the constructions best adapted for their own particular service range. From copper wires to protective jackets these cables are made entirely in Roebling plants where modern machines and methods assure highest, uniform quality.

A large part of Roebling's complete wire and cable line is required in today's rearmament program. You can count on the Roebling organization and distributors, however, to give you the best possible delivery service. John A. Roebling's Sons Company, Trenton 2, New Jersey.

ROEBLING

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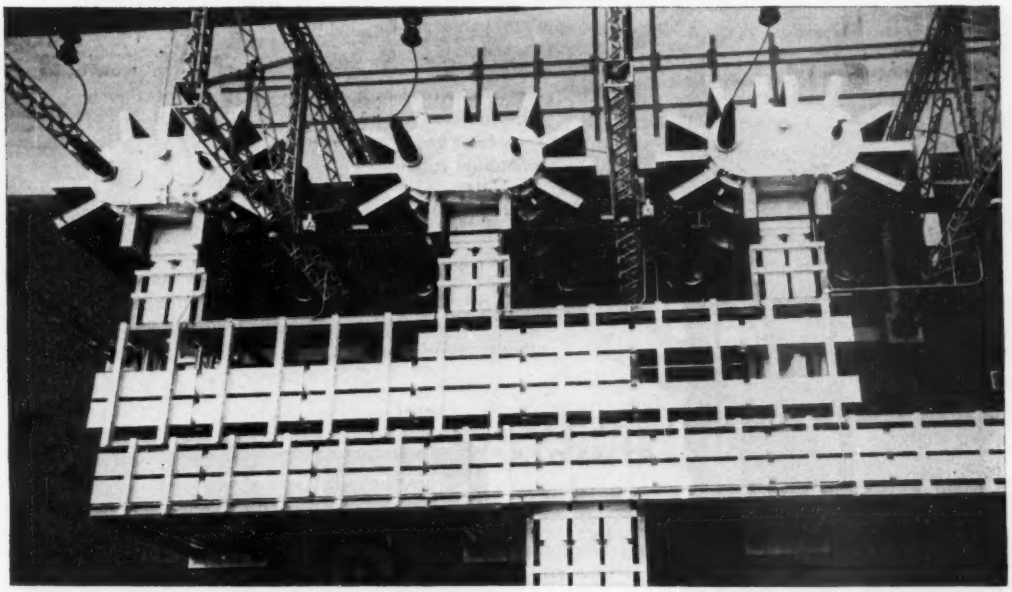
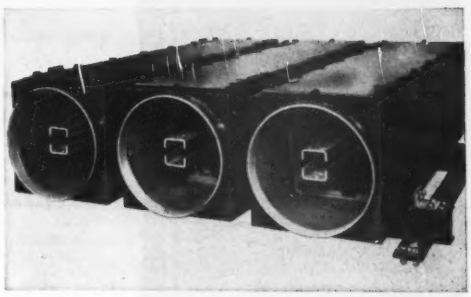
Vital Station Interconnections Get Maximum Protection



isolated-phase bus

With G-E isolated-phase bus runs for vital interconnections between generators, transformers and main switchgear, you know that every precaution is taken to insure freedom from faults of every type. Dust-tight, weather-tight aluminum construction seals out many possible causes of flashover. Advanced G-E design reduces the number of creepage surfaces without sacrifice of mechanical strength. Supplied in either individual-phase sections or as a complete three-phase package, G-E isolated-phase buses simplify installation problems and cut costs.

Your G-E sales representative has complete information. Ask him for a copy of GEA-5460, a 28-page publication that will aid you in planning your buses, or write to General Electric Company, Schenectady 5, N. Y.



Typical three-phase section of G-E isolated-phase bus. Bus is copper, channel-type to provide maximum strength. Silver contact surfaces assure full flow of current and eliminate oxidation troubles. Insulators conform to NEMA standards, are normally carried in stock in power stations. Gasketed, aluminum cover has two sets of hinges to permit opening from either side. Lugs release covers without removal of any bolts. End bells are welded to housing. Adjacent ring flanges are tightly joined by split aluminum bands whose mating edges are also gasketed.

855-26

GENERAL ELECTRIC

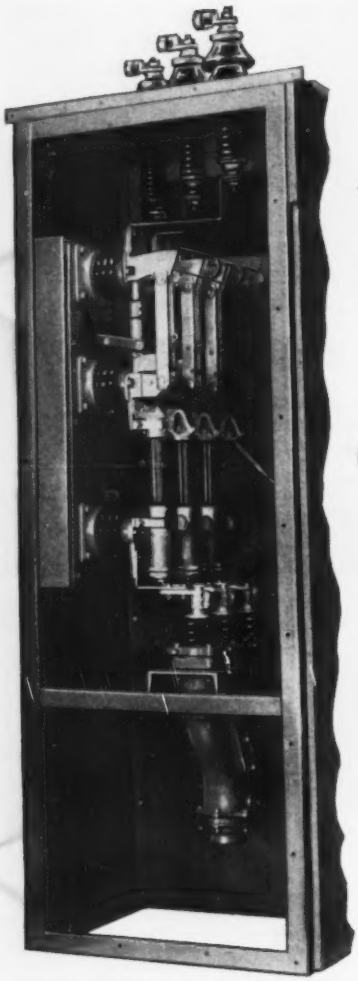
Buy FIRST CLASS Switchgear and SAVE MONEY TOO!

For substations, load and switching centers Three E switchgear is built to high standards of (1) Safety (2) Accessibility and in a style that permits of (3) Economy.

1. **Equipment is metal enclosed with all design features in accordance with best engineering and manufacturing practices. When requested positive interlocks with enclosure doors and associated equipment provide additional safety.**

2. **All component parts are readily accessible for inspection, adjustment and maintainance.**

3. **Because Three E Air Interrupter Switches are used for load switching, and power fuses for clearing short circuits, substantial savings in costs are possible, over other types of equipment.**



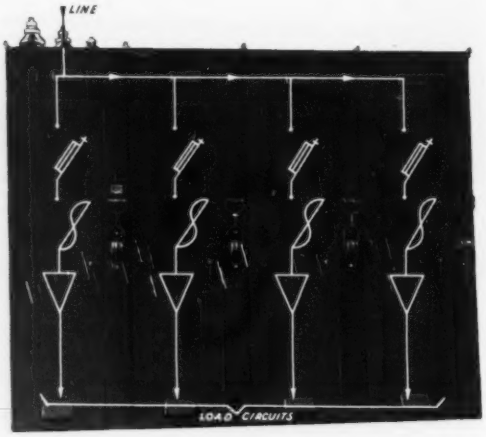
End view with side plate and barriers removed.

SYMBOLS

Air Interrupter Switch

Power Fuse

Cable End Bell



Front view of outdoor type four circuit switchgear assembly.

All Three E switchgear follows the modern trend of using self generated gas blasts which confine and extinguish arcs with no damage to equipment.

Consult your nearest Three E representative, or write us direct regarding your switchgear requirements.

ELECTRICAL ENGINEERS EQUIPMENT CO.
MELROSE PARK, ILLINOIS

GUARANTEES *Performance* HERE

Insulator replacements are costly regardless of whether your transmission lines are readily accessible or in remote and rugged country. You can depend on Porcelain Products Suspension Insulators giving top performance because every employee is imbued with the idea that the very insulator on which he is working may be the one which will be given the supreme field test on your lines. Thus the exception in quality control becomes *routine* in all phases of Porcelain Products insulator production.

As an example, EVERY Porcelain Products Suspension Insulator goes thru the following ROUTINE tests:

1—On *every* unassembled porcelain shell
- a—FULL THREE SECOND high frequency flashover

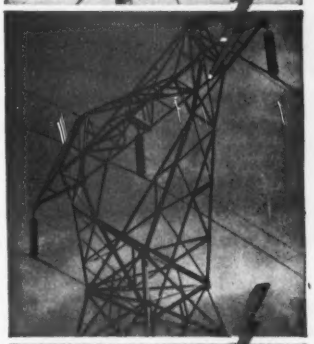
plus
- b—FULL FIVE MINUTE vigorous and continual 60 cycle flashover.

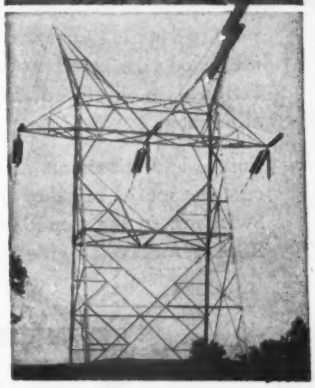
2—On *every* assembled insulator
- a—FULL FIFTEEN SECOND high frequency flashover

3—On *every* assembled insulator
- a—Mechanical pull test to 40% of its rated mechanical strength.

NOTE—These tests go considerably beyond the minimum requirements of AIEE Standards No. 41 to prove the stamina of Porcelain Products Suspension Insulators.

Rigorous testing and insistent checking of all phases of production, together with outstanding field performance-experience are your assurance of installing better insulators when you specify—Porcelain Products, Inc.





Porcelain Products, Inc.

PARKERSBURG, WEST VIRGINIA

EXPORT REPRESENTATIVE:

Philips Export Corp., 100 E. 42nd St., New York 17, N. Y. U.S.A. Cable Address: "PHILYORK"

No. 3- specify the best

★ *The Hi-Voltage Type C-W Air-Break Switch is the best available for substation work up to 69 kv. For ratings above 69 kv, specify Type L-W.*

The electrical, mechanical and design elements of the Type C-W have been co-ordinated with the best materials obtainable to provide something more than efficient operation. The Type C-W assures:

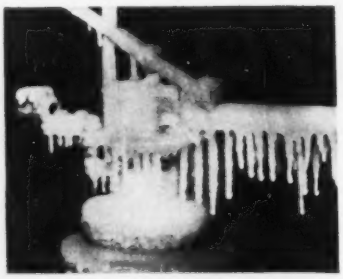
- **Life beyond the age of any substation**
- **Attractive appearance that matches the best of substation design**
- **Lowest possible installation cost**
- **Easy, certain operation**
- **Unmatched dependability**

Sleet, ice, years of standing idle have little effect on the operation of a Hi-Voltage switch. Certain operation is assured by the straight push-pull, close-open action of the switch arm. After clearing the contact housing, the arm is swung completely open by the powerful and precision-built operating mechanism.

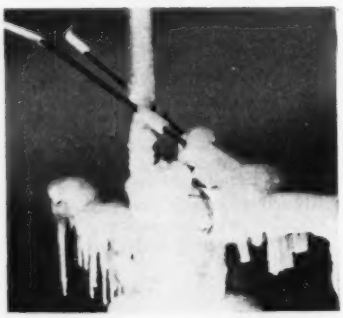
And any Hi-Voltage design reduces switch installation cost from 20 to 40%, because the mechanism is completely pre-machined and pre-fitted at the Factory. All parts are positively identified . . . keyed to easy-to-follow installation data. Field cutting and drilling are eliminated.

Future advertisements in this series will discuss the merits of other types of Hi-Voltage Switches. In the meantime, ask your Joslyn Representative to give you the whole story.

Hinge end of C-W switch completely enclosed by a 6-hour deposit of ice. A gradually applied pull of 60 pounds on a 28-inch lever cracked the ice at the hubs of the crank and freed the mechanism.



Contact end of C-W switch frozen in closed position by more than an inch of ice. Switch was opened without difficulty.

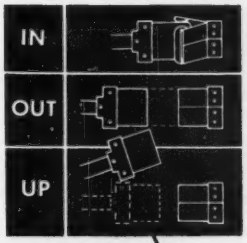


C-W switch being closed through a heavy deposit of clear ice. Switch was closed at the speed of motor operation. No difficulty was encountered because of the ice-breaking contact housing.

HI-VOLTAGE

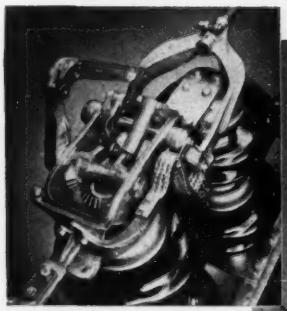
...type C-W air-break switch

IN-OUT SWITCH ACTION . . . Straight-line motion of the switch-arm provides positive opening and closing of the switch.

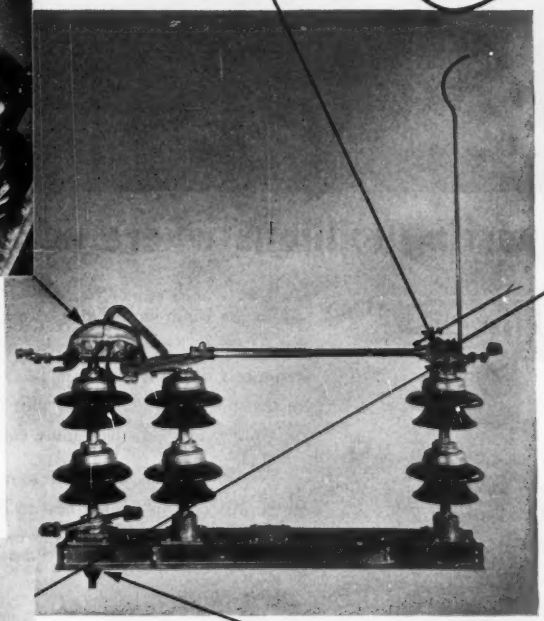


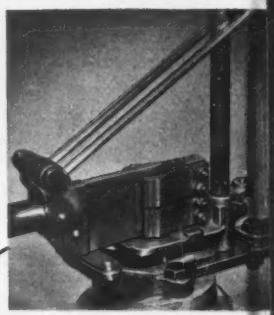
Hi-Voltage SWITCHES ARE AVAILABLE

from 200 to 3000 Amperes, 7500 to 161,000 Volts for upright, underhung or vertical mounting.

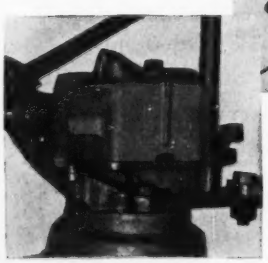


OPERATING MECHANISM is completely housed, very compact and exceptionally powerful. Every part is corrosion-proof . . . graphite insert bearings are used throughout . . . balancing spring is stainless steel . . . gears and cranks are bronze. There is nothing that can stick or bind, nothing to lubricate and nothing to adjust.

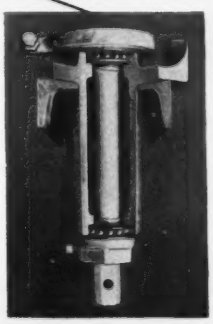




SILVER-NICKEL CONTACTS combine low resistance with low friction. Stainless steel springs maintain maximum conductivity.



CONTACT HOUSING protects contacts against sleet, dirt and arcing. Also, it acts as an ice breaker.



MAIN BEARING carrying rotating insulator is a forged steel spindle mounted in monel ball bearings and stainless steel races. Never requires lubrication.

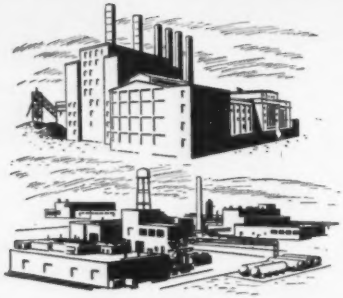
ALSO AVAILABLE!

- Grounding Switches
- Manual and Automatic Control Mechanisms
- Mechanical Interlocks
- Hi-Voltage Fuses
- Cross-arms and Mounting Frames
- And all customary accessories

EQUIPMENT COMPANY

4000 EAST 116th STREET • CLEVELAND 5, OHIO

They're investing millions where mining *pays!*



→ In the Bituminous lands of the B&O, progress never stops. Year after year, enterprising coal producers back their faith in B&O coals with new mines and processing plants, with increased mechanization and up-to-the-minute equipment.

B&O Bituminous lends itself to modern, low-cost mining. Because of its nearness to America's industrial heart, transportation costs are moderate. Markets are dependable, and there is a wide variety of coals to meet all needs.

Smart consumers "bank on B&O Bituminous"—its sources and reserves are known and great.

Ask our man!

BITUMINOUS COALS FOR EVERY PURPOSE

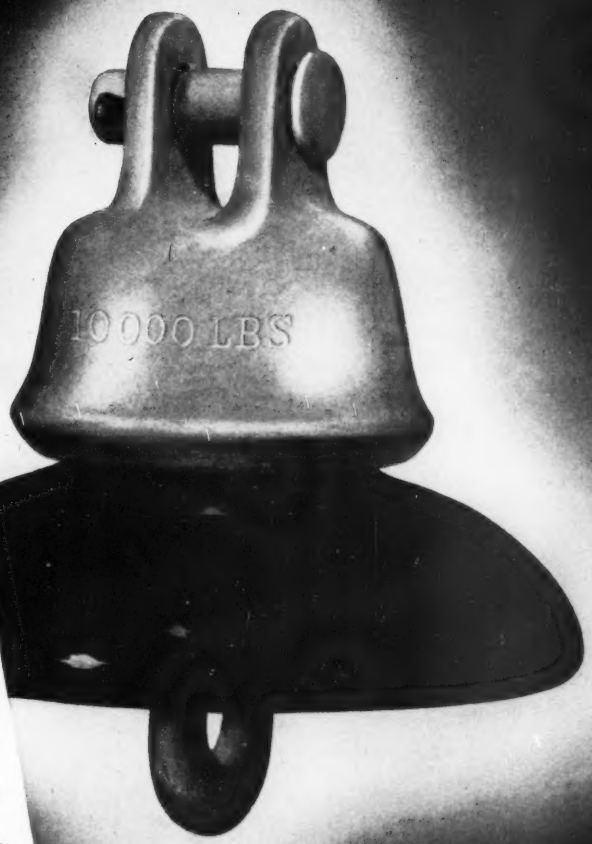
LINKING 13 GREAT STATES WITH THE NATION
B&O

BALTIMORE & OHIO RAILROAD

Constantly *doing things*—**better!**

LOCKE

presents masterpieces of
insulator engineering



Perfection

...in low voltage suspensions typified by

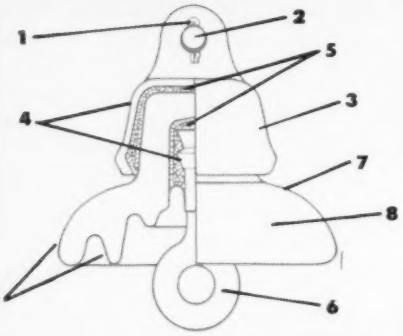
LOCKE'S

No. 16583

Take this step toward further reducing your cost per kilowatt hour. Test Locke's Low Voltage Suspensions on a dollars-and-cents basis. You'll find that excellence of design and manufacture enable them to generally out-perform all others. This, of course, is the reason why utilities have specified them by the tens of millions since their original development in 1904.

Presenting A MASTERPIECE OF INSULATOR ENGINEERING

The LOCKE low voltage Suspension Insulator



You get ALL these advantages in this LOCKE DESIGN

1. Humped cotter key saves time and labor because linemen can install and remove cotter bolt faster, easier.

2. High strength cotter bolt assures service continuity.

3. Top quality forged steel or malleable iron caps, and forged eyes . . . add years of dependable service to the insulator.

4. Corrosive action on metal parts due to action of cement is eliminated because these surfaces are coated with a special non-hardening, resilient coating. This coating not only acts as an expansion joint which eliminates breakage due to temperature changes, but it also helps distribute loads efficiently.

5. Locke Compression Sand, applied at both cement joints, gives added strength and stability to the insulator.

6. Hot line work is greatly simplified because ample clearance is provided between the eye and the porcelain . . . and because of the humped cotter key at the top of the insulator.

7. The possibility of breakage, caused by thermal shock and mechanical impact, is greatly lessened because porcelain surface is covered with Locke Compression Glaze.

8. Because Locke Wet-Process porcelain is used throughout, the insulator is fully capable of withstanding power arcs, lightning flashovers and extremely rough handling.

9. You get highly satisfactory performance during electrical storms and rains because of adequate flashover ratings . . . and maximum leakage distance.

YOU ARE EQUALLY SURE of getting a masterpiece of design when you specify other products in the complete line of Locke Insulators and suspension hardware. Each pays off in superior performance on transmission and distribution lines, generating stations, sub-station and electrical apparatus.

LOCKE
INCORPORATED
BALTIMORE • MARYLAND

LOW VOLTAGE PIN TYPE INSULATORS

HIGH VOLTAGE PIN TYPE INSULATORS

SUSPENSION INSULATORS

SWITCH & BUS INSULATORS

SPOOL INSULATORS

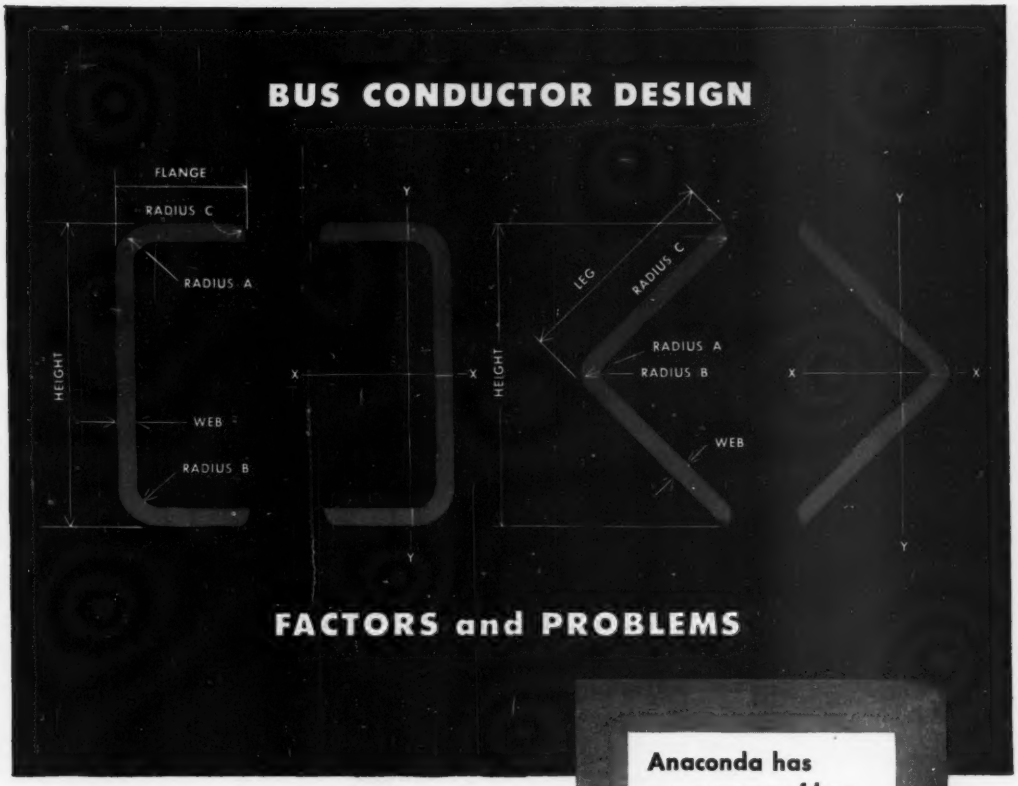
GUY INSULATORS

LIQUID-FILLED BUSHINGS

SUSPENSION & STRAIN CLAMPS

SUSPENSION HARDWARE

RADIANCE BUSHINGS



Effect of Cross-Sectional Shape in Bus Bar Design

Good bus design demands ability to carry full loads safely, to keep temperatures within the specified limit and to provide the necessary mechanical strength—at the lowest possible cost consistent with all three.

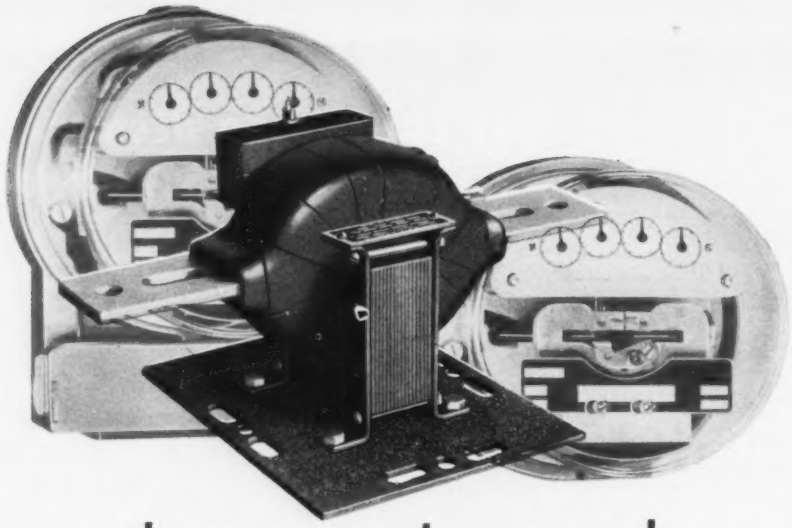
To meet all combinations of these requirements, ANACONDA Bus Equipment is produced as flat bars, tubes, channels, angles and cables. Each possesses its own electrical and mechanical characteristics.

To help you plan your bus installation and select the right bus design is our Technical Department's job. Ask for a copy of "ANACONDA Copper Bus Conductors." The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

Anaconda has many years of bus conductor experience

Anaconda has done much to improve bus conductor practice —is organized to help you plan your installations. Today ANACONDA *products and technicians are cooperating effectively throughout the entire field of power generation, distribution and application to provide bus conductors that will afford maximum capacity, security and economy for any specified job.*

Carry the load with ANACONDA® Bus Conductors



Meters that tell the truth ...

DEPEND ON ACCURATE INSTRUMENT TRANSFORMERS

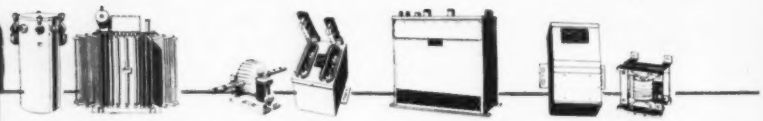
...and accuracy is the watchword at The Standard Transformer Company, where Current, Potential and Metering transformers are built to meet the highest NEMA, AIEE and EEI requirements.

Most economical to use . . . type NAS current transformer (shown above) enables users to stock only a few sizes to cover the entire field of low voltage measurement. This is just one of the complete line of instrument transformers that are "Standard-built" to save you money.

Write for BULLETIN S-501-B . . . It's New

Packed with technical information on Current, Potential and Metering transformers, a 32-page bulletin complete with detailed drawings, accuracy limits, ratio and phase angle curves is ready for you. Every type of instrument transformer produced by The Standard Transformer Company is illustrated and described fully. You can have Bulletin S-501-B on your desk by merely writing for it today.

FOR EVERY APPLICATION

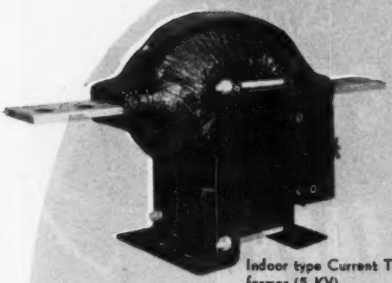


Liquid filled (sizes up to 10,000 KVA and 72 KV inc.)

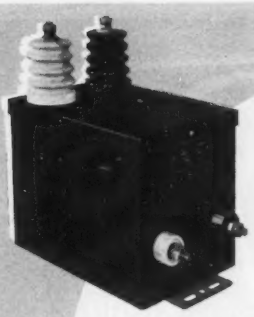
Instrument transformers (for use on circuits up to 72,000 volts, inc.)

Dry type (up to 1000 KVA and max. voltage ratings of 4800.)

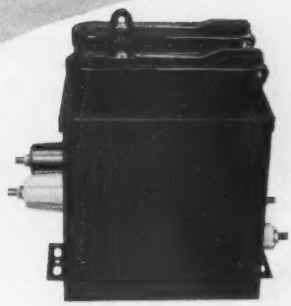
Control transformers (compound filled or open type.)



Indoor type Current Transformer (5 KV).



Indoor type unfused Potential Transformer 200 VA, 2400/120 volts, 60 KV FW impulse level.



Indoor type Potential Transformer with Current limiting fuses, 200 VA, 2400/120 volts, 45 KV FW impulse level.

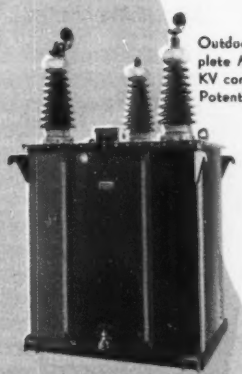
Standard

TRADE MARK ®

CURRENT, POTENTIAL AND METERING TRANSFORMERS

. . . Indoor and Outdoor Current and Potential Transformers . . . Metering Sets . . . Instrument Transformers for Special Applications.

Outdoor type, OISC Potential Transformer for 34.5 KV service.



Outdoor type, OISC complete Metering set for 69 KV containing Current and Potential elements.

Outdoor type, OISC Current Transformer for 46 KV service.

The Standard Transformer Co.

WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

Specify
ACCURATE TAPES
–for every wiring need!

ACCURATE FRICTION TAPE

Features the best of material carefully fabricated to provide maximum mechanical protection. Available in Standard and A.S.T.M. grades.

ACCURATE RUBBER TAPE

Offers high elasticity, high dielectric strength and super aging qualities. Made in both Standard grade and A.S.T.M. – A.A.R. Specification

ACCURATE PLASTIC TAPE

Thin caliper plus a combination of good mechanical and dielectric strengths. Recommended for use wherever plastic tape is practical.

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electrical men!
It's easier and faster with ACCURATE TAPES
Best from all angles — that's Accurate tape. Faster applying because of super workability and cohesion. No heat or pressure, required for Accurate Rubber Tape, either. Try Accurate on your next job.

for the electrical industry are manufactured to precision standards by men who have devoted a lifetime to producing tapes of superior quality. Every foot is carefully made and constantly inspected to assure uniform high quality. The sure way to complete tape satisfaction is to specify ACCURATE by name — every time. Get all the facts on ACCURATE Tape now! Just call or write the Accurate Manufacturing Company, Garfield, New Jersey, for new illustrated literature which includes complete specifications and technical data covering the entire ACCURATE line of quality tapes. There is no obligation.

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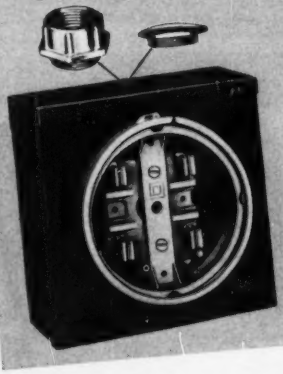
MORE THAN A QUARTER CENTURY OF TAPE SPECIALIZATION

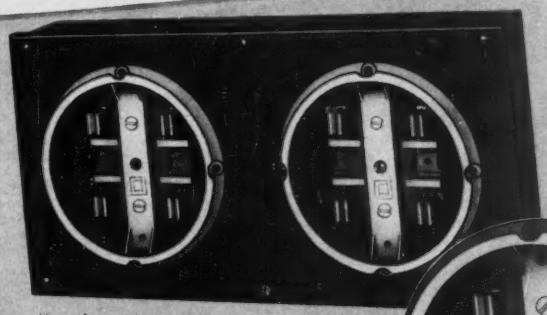
NEW SQUARE D

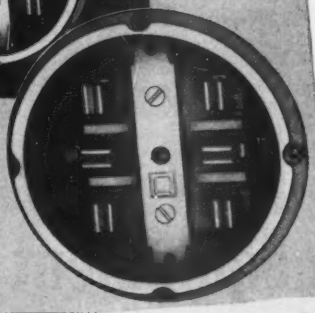
SOCKET METER TROUGHS

DESIGN LEADERSHIP

EASY TO WIRE INDOOR OR OUTDOOR TYPES







ABOVE • **2 Socket Meter Trough**—indoor type showing vertical position of jaws.

LEFT • **Outdoor type single socket trough** with socket. Front cover and die-cast ring only can be removed, leaving socket base accessible for easy wiring.

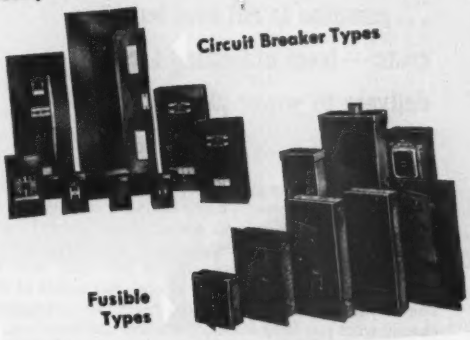
RIGHT • **Meter socket** showing one-piece porcelain base with six jaws. Base mounted on bracket with soft spring. Permits easy alignment of clips with cover.

Square D's new socket meter troughs are designed to mount the Type S meter which is currently in general use.

Rated 100 amperes, the sockets accommodate up to six jaws easily converted to either horizontal or vertical positions—have one-piece porcelain base designed for easy wiring, high dielectric and durability.

Meter troughs accommodate 1 to 4 meter sockets for meter "ganging"—provide generous wiring space and ample knockouts—available as indoor or outdoor types with flush or surface mounting covers. Outdoor troughs are designed to include Square D's interchangeable hubs.

Completes the Line of Service Entrance Equipment



Circuit Breaker Types

Fusible Types

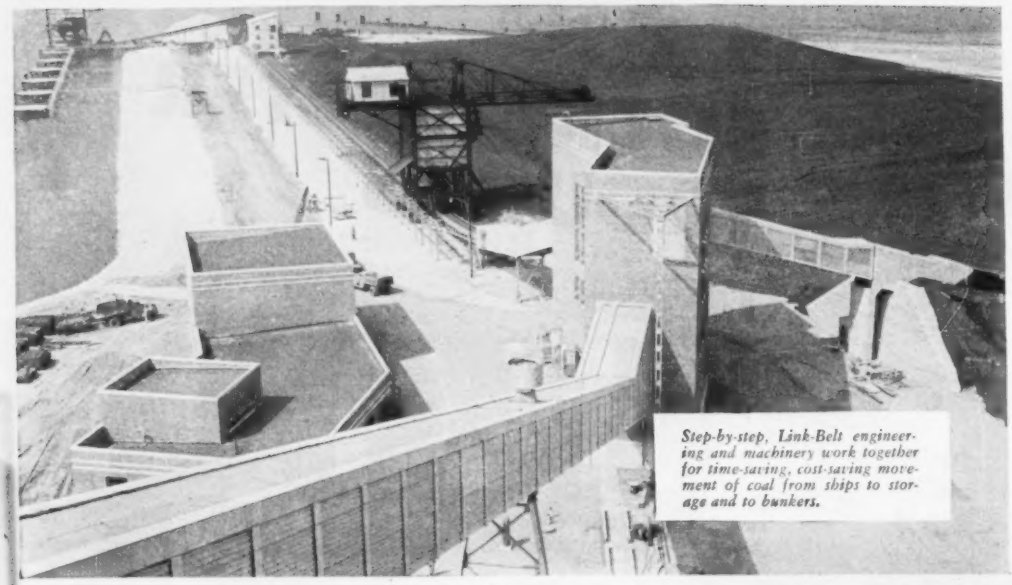
ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

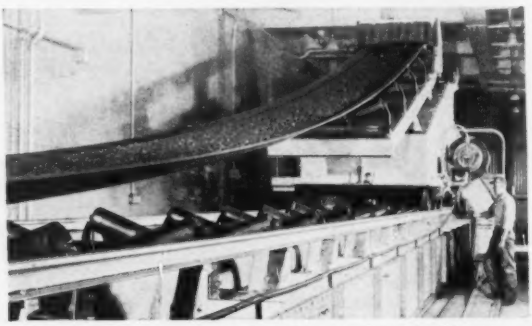
LINK-BELT engineering...



Step-by-step, Link-Belt engineering and machinery work together for time-saving, cost-saving movement of coal from ships to storage and to bunkers.

LINK-BELT equipment...

...combine to cut coal handling costs — from unloading to delivery to power plant bunkers



Link-Belt answers a vital need for the more efficient handling of coal in power plants—large and small. Here a Link-Belt Belt Conveyor and motor-operated traveling tripper distribute coal to bunkers through a dust-tight bin seal.

YOU name your coal handling problem—look to Link-Belt for the answer! Based on experience gained in hundreds of installations in power plants everywhere—Link-Belt has the facilities, the proven equipment, the engineering know-how to carry the ball from start of operations planning to delivery of coal. Regardless of the size of your plant—Link-Belt engineers can recommend exactly what you need for more efficient coal handling.

Conveyors, elevators, feeders, car dumpers and shakers, screens, hoists, hoppers, chutes, gates, stackers, unloading towers, weigh larries and related power plant equipment and accessories—all can be supplied by Link-Belt—*the most complete line* in the field.

So for simpler, more efficient, increased capacity coal handling methods—lower operating and maintenance costs—call on Link-Belt.

Our engineers will cooperate with you or your consultants to find the most economical solution for your problems. Write for details.

12.204

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Johannesburg. Offices in Principal Cities.

LINK-BELT
COAL HANDLING EQUIPMENT

POWER

Bechtel-engineered and Bechtel-built—more than ★one million horsepower of electric generating capacity, plus distribution systems and industrial installations.

★ Now in progress or recently completed for the power utilities.

DESIGN • PURCHASING • CONSTRUCTION

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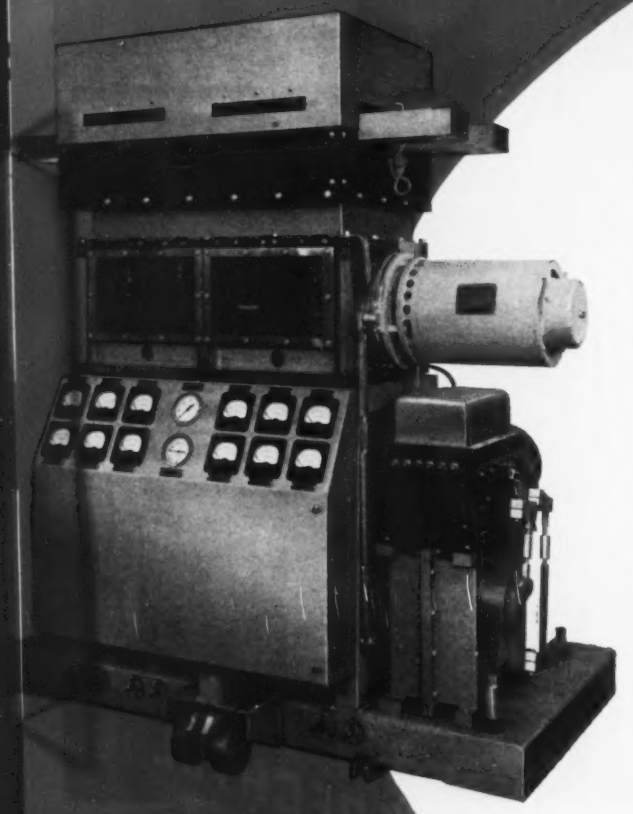
"BUILDERS FOR INDUSTRY"

SEVEN I-T-E MECHANICAL RECTIFIERS



The heart of the I-T-E Mechanical Rectifier—one 10,000 ampere contact mechanism with contacts enclosed in box on top. Driving eccentric can be seen through windows. At right is the drive motor, with the automatic regulator below. The 12 indicating instruments show the timing of each contact while the mechanism is running and carrying load.

I-T-E Mechanical Rectifiers are available in the following ratings: 4,000—5,000—6,000—7,000—8,000—9,000—and 10,000 amperes, in any voltage from 50 to 400 volts d-c. Primary voltages: 2,300 to 46,000 three-phase a-c.

Two years ago, Buffalo Electro-Chemical Company, Inc., Buffalo, N. Y., installed two I-T-E Mechanical Rectifiers, the first mechanical rectification units ever built in this country.

This pioneering spirit of Buffalo Electro-Chemical's progressive management justified itself to the extent that at present I-T-E has orders for five more Mechanical Rectifiers—to augment Buffalo's current modernization program.

I-T-E's Mechanical Rectifier has benefited Buffalo Electro-Chemical—and can handle your low voltage power conversion requirements more effectively.

1 **HIGHER EFFICIENCY**—actually 96% or more in the 100 to 400 volt range, because silver to silver contact minimizes voltage drop in rectifying element.

2 **SPACE SAVINGS**—extremely compact grouping of all operating and protective apparatus.

3 **EASY, LOW-COST INSTALLATION**—unit assembly at factory allows "packaged" delivery, easy installation. No special structural foundations are required; no crane service is needed in rectifier room.

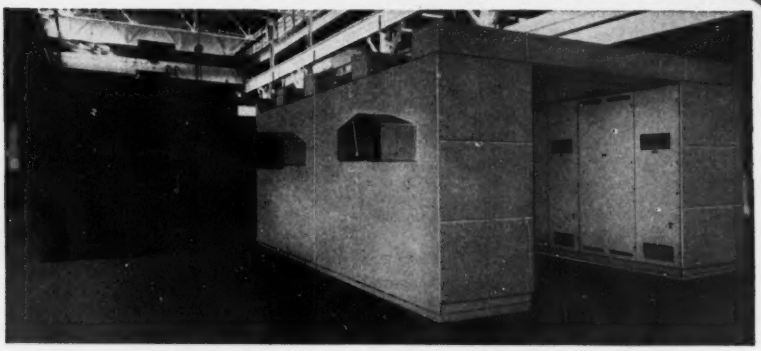
4 **SIMPLE, LOW-COST MAINTENANCE**—maintenance is almost entirely mechanical, requiring no trained personnel, complicated tools or instruments for servicing.

5 **SIMPLE OPERATION**—push-button starting without preliminary warm-up of any kind; immediate connection to load.

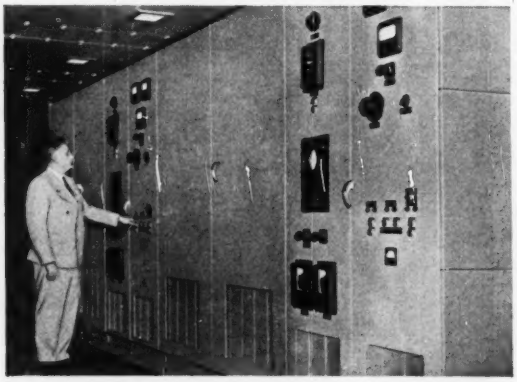
6 **SAFETY**—use of low voltage in your cell room increases safety to operating personnel and equipment.

FOR BUFFALO ELECTRO-CHEMICAL

TYPICAL I-T-E MECHANICAL RECTIFIER ARRANGEMENTS



Factory assembly of two 10,000 ampere units with outdoor transformer (only one of two shown), throat connection through wall rectifier enclosure, operating aisle and d-c switchgear compartments.



Close-up of control and instrument panel. The thoroughness of I-T-E engineering is illustrated by the overhead lights, furnished with the installation and assuring proper illumination of the control panel.

View looking through operating aisle [illegible] rectifier enclosure and control panel to left, d-c switchgear to right, interconnecting d-c bus overhead.

I-T-E

R&IE

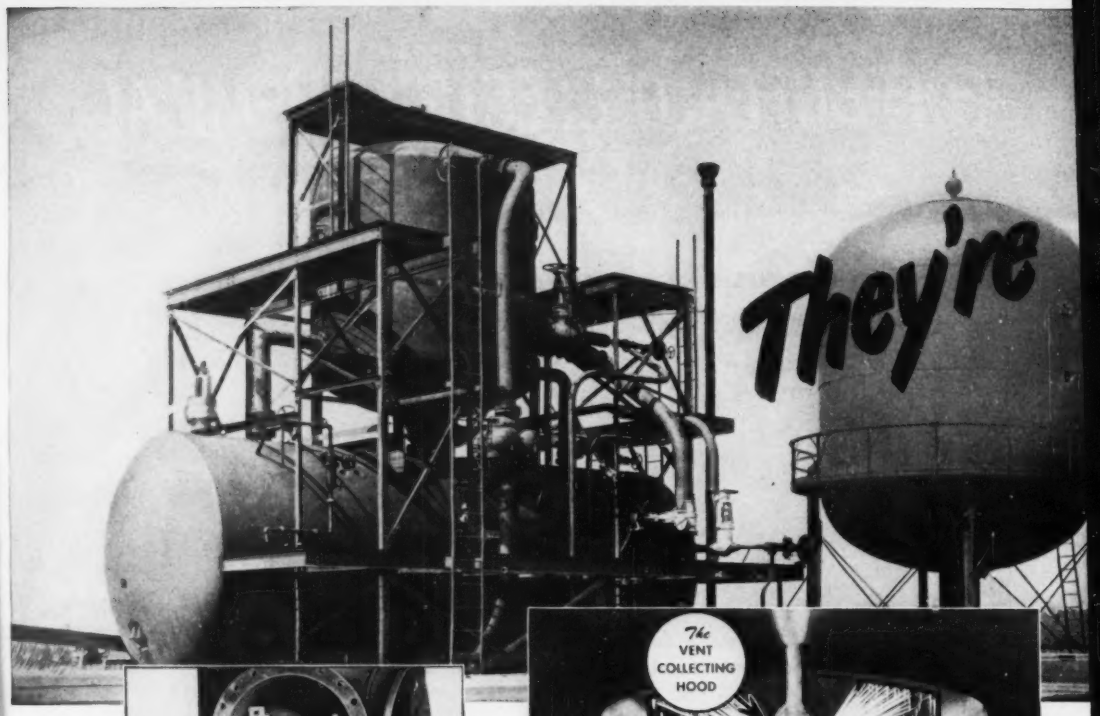
MECHANICAL RECTIFIERS

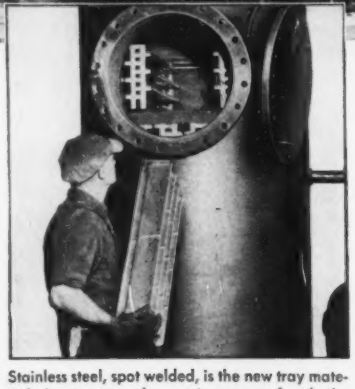
I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pa.

Power Switching Equipment: Railway and Industrial Engineering Co., Greensburg, Pa.

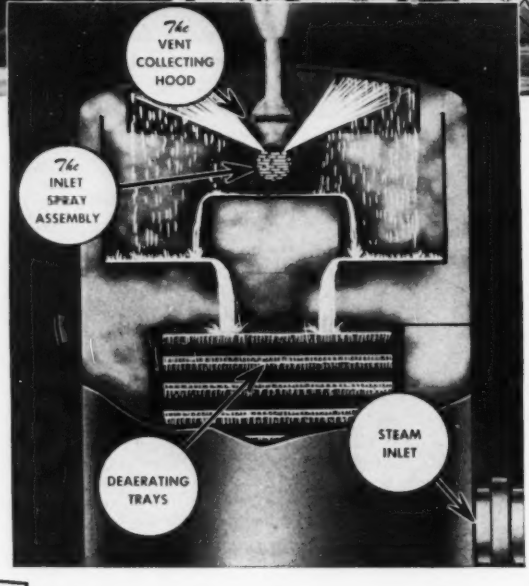
Canadian Mfg. & Sales: Canadian Power Devices, Ltd., Toronto • Export Sales: Philips Export Corp., New York

MECHANICAL RECTIFIERS • SWITCHGEAR • BUS SUBSTATIONS • ISOLATED PHASE BUS STRUCTURES • CIRCUIT BREAKERS • RELAYING • SPECIAL PRODUCTS



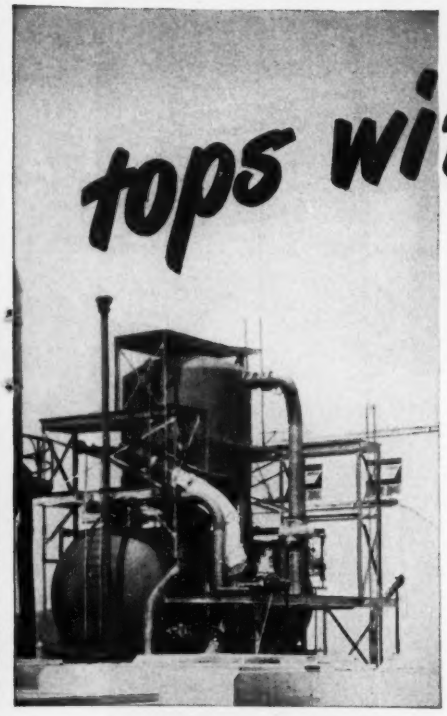


Stainless steel, spot welded, is the new tray material. It gives equal capacity at one-fourth the weight of cast iron. A tray assembly can be easily handled by one man without lifting equipment.



ELLIOTT COMPANY

Deaerator and Heater Dept.
JEANNETTE, PA.



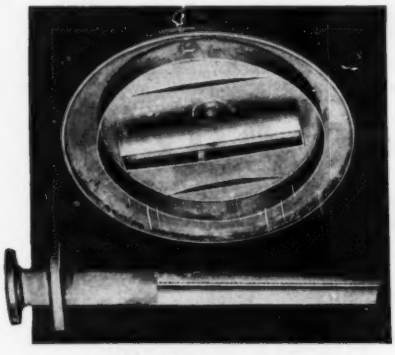
tops with utilities!

ELLIOTT
Deaerating Heaters

The distinguishing mark of any new important station is apt to be the newest type Elliott deaerating feedwater heater mounted upon its storage tank, silhouetted against the sky.

The installation at the left is typical—a fine new Southern Station with one 100,000 kwh unit already operating, a second similar unit under construction and two additional units planned. Two of the Elliott deaerating heaters, of 975,000 lb per hr, are already installed, and a third on order.

These new type Elliott deaerating heaters have design elements which eliminate a large percentage of the maintenance formerly necessary. The tubular vent condenser is replaced with an inlet spray unit and vent collecting hood which normally require no maintenance. Trays, formerly of heavy cast iron, are now of fabricated stainless steel—light and corrosion-proof. Non-corrodible materials are used everywhere undeaerated water contacts the metal. All in all, the new unit is characteristically Elliott in conception, in engineering excellence, in performance.



This is the unit that takes the place of the tubular vent condenser with its many small tubes, formerly mounted on top of the deaerating heater shell. The inlet spray unit and vent collecting hood are inside the shell, (see section drawing on the opposite page). Saves maintenance, saves headroom, makes a better installation.

The complete description of the Elliott deaerating heater will explain why it is favored by the largest utilities, as well as in smaller industrial plants. Write for Bulletin N-16.

N-1001

Plants at: JEANNETTE, PA. • RIDGWAY, PA.
AMPERE, N. J. • SPRINGFIELD, O. • NEWARK, N. J.
DISTRICT OFFICES IN PRINCIPAL CITIES

HALF CENTURY OF 1901 ELLIOTT 1951 POWER PROGRESS

The Perfect Combination . . .

WESTERN RED CEDAR POLES

LIFE-SPAN full length Immunization

Here truly is an unbeatable combination . . . Nature's most perfect poles treated the LIFE-SPAN way. Every Western Red Cedar Pole receives complete end-to-end treatment, first in a hot solution to drive out the air and prepare the wood cells for preservative absorption; next a sudden submersion under a cold pentachlorophenol solution which contracts the expanded air in the cells. This creates a vacuum sufficient to pull the solution deep into the sapwood. Pole protection is sealed for life, insuring dependable service up to pole line obsolescence.

Linemen like LIFE-SPAN poles because they are clean, easy to handle, and safe to work on. Utility companies like them because they offer dependable service and they build good public relations for the companies using them.

To be sure, to be doubly safe . . . specify LIFE-SPAN Western Red Cedar Poles.

The same LIFE-SPAN treatment is also available for Fir, Western Larch and Lodgepole Pine.

CONSOLIDATED TREATING CO.
MINNEAPOLIS, MINNESOTA

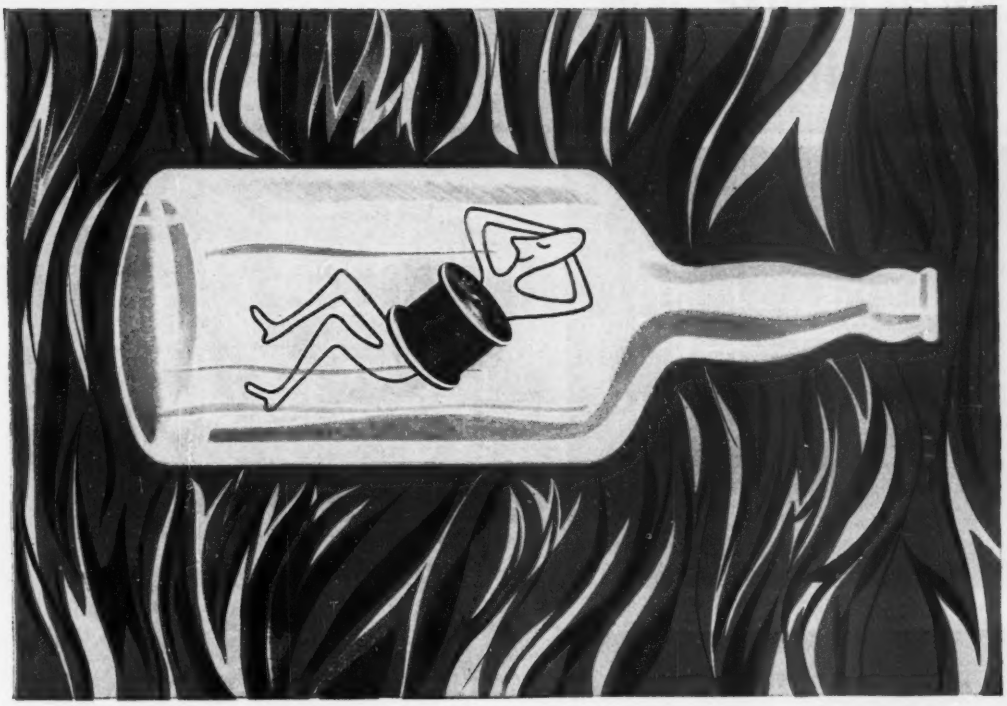
For further information write any of the following:

NAUGLE POLE & TIE CORP.
Chicago, Illinois

PAGE & HILL, INC.
Minneapolis, Minnesota
50 Church Street, New York, N. Y.

B. J. CARNEY & CO.
Spokane - Minneapolis

SCHAEFER-HITCHCOCK CO.
Sandpoint, Idaho
Suppliers for Joslyn Mfg. & Supply Co.



VITROTEX magnet wire is insulated with glass!

VITROTEX *withstands* more heat *(up to 130° C., 266° F.).*
VITROTEX *requires* less space *(coils can be smaller).*
VITROTEX *gives* longer life.
VITROTEX *gives greater overload protection.*
VITROTEX *retains superior dielectric strength at higher temperatures and at high relative humidity.*
VITROTEX *is as smooth as silk (easy to handle and wind).*
VITROTEX *is resistant to attack (water, acids, oils, and corrosive vapors).*

Vitrotex* is designed for heavy-duty electrical equipment where operating temperatures, hot spots and space factor all present a problem. Vitrotex can solve that problem with windings that can be more compact, give dependable service for a longer period under adverse temperature conditions. For information about this glass-insulated wire and other types of ANACONDA Magnet Wire, get in touch with your nearest Anaconda Sales Office or Distributor. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

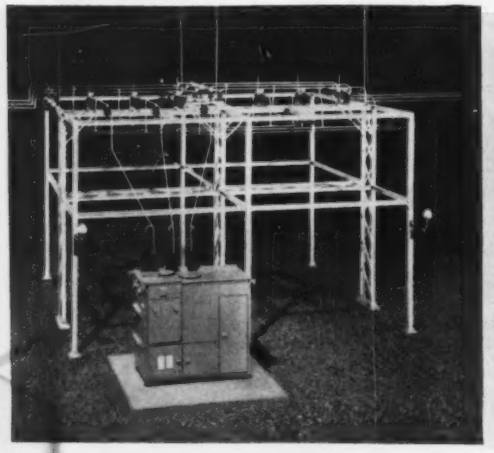
*Reg. U. S. Pat. Off. 51344

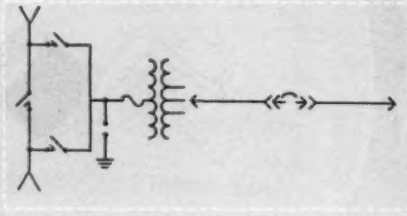
the right wire for the job

ANACONDA® **WIRE AND CABLE**

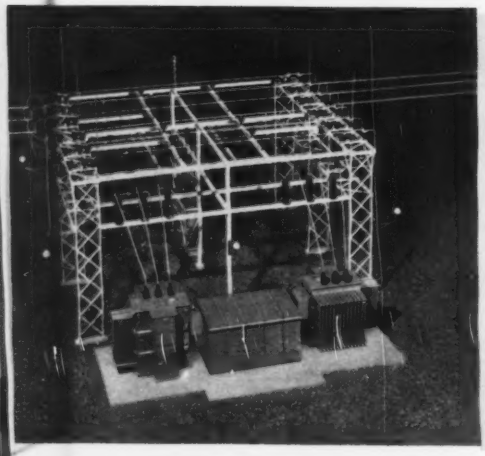
YOU CAN BE **SURE**.. IF IT'S

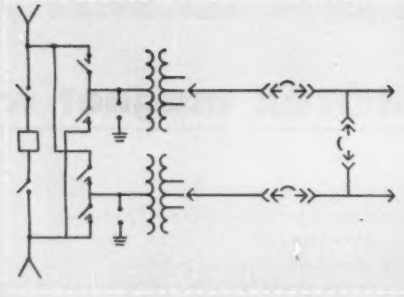
Westinghouse



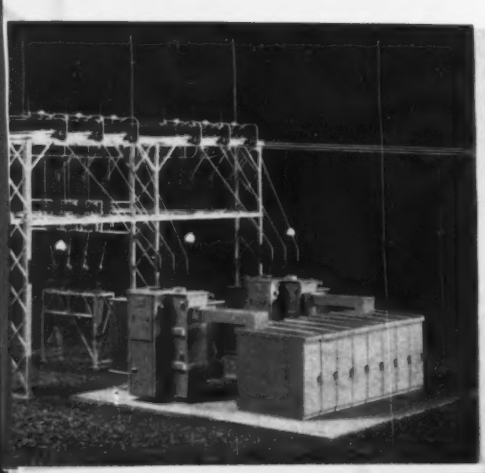


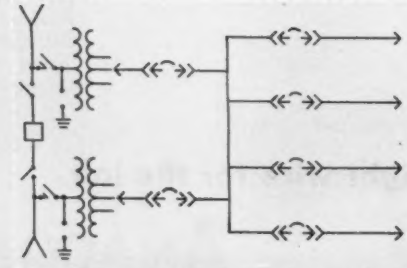
Single-feeder CSP Substation—Loop or tie subtransmission circuit—Manual sectionalization, manual selection.





Two-feeder Duplex Substation—Loop or tie subtransmission circuit—Automatic sectionalization, manual selection.

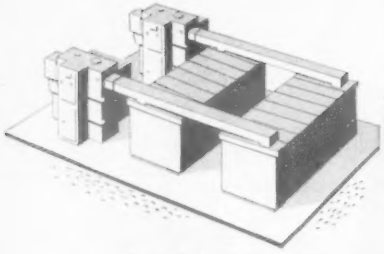




Three-or-more-feeder Spot Network Substation—Loop or tie subtransmission circuit—Automatic sectionalization.

SUBSTATIONS with A FUTURE

...lower power distribution costs



The system planning you do today must allow for future load growth, and load shifts . . . if lower power distribution costs are to be realized. The substations you choose *now* will help make this possible . . . *if they are designed with a future!*

The Westinghouse Coordinated Substations, shown here, have this "allowance for the future". They not only meet today's load demands, but provide the flexibility vital for future changes in load requirements. *They Become One of Your First Steps in Lowering Power Distribution Costs.* Their design is a result of today's modern power distribution trends. These trends are reducing distribution costs by simplifying systems and standardizing equipment. Simplifying subtransmission circuits reduces the amount of equipment used. Standardizing equipment results in production savings that are passed on to you.

Due to the compactness of these Substations, "blocks of power" can be easily and economically added or removed to take care of increased load requirements, load shifts or relocations. You realize maximum salvage value.

For more complete information, get your copy of the Coordinated Substation Book, B-4061. Ask your Westinghouse representative for it, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60728-A

Westinghouse

COORDINATED SUBSTATIONS

IMPORTANT NEW INSULATING COMPOUND

...For Low-Temperature Flexibility Down To -60 deg. C.

...For Jacketing Exterior Cables Used For Communications and Power Wherever Weathering Is a Problem.

A new VINYLITE Brand Plastic electrical insulating compound that remains flexible and tough even at temperatures approaching minus 60 deg. C. has been introduced by Bakelite Division.

This new addition to the line of VINYLITE Plastic wire and cable compounds is extremely weather resistant. Its outstanding applications include jacketing cables for use in cold climates such as exterior lead-in cables for rotating television antennas. The problem of damage from wind-slapping or abrasion at sub-zero temperatures is reduced.

In addition, the new compound provides the vitally important properties common to other VINYLITE Plastic insulation materials, including excellent electrical resistance, and resistance to water, mildew, oils, greases, alkalies, most strong acids and other chemicals. Flame resistant compounds are available.

For information on wire and cable of many types, insulated with VINYLITE Brand Plastics, and a list of representative suppliers, write today to Dept. JU-28.

Vinylite BRAND **PLASTICS**

TRADE MARK

BAKELITE COMPANY

A Division of

Union Carbide and Carbon Corporation

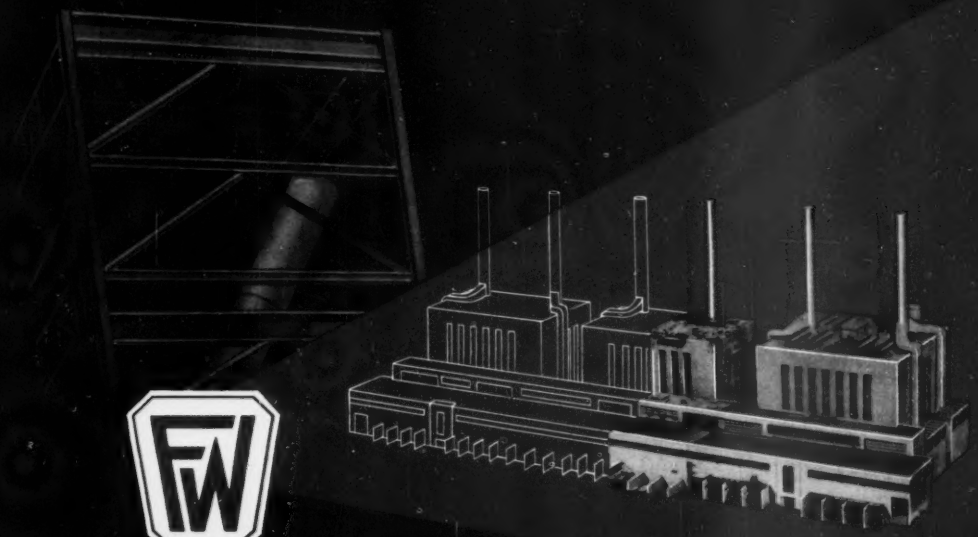
30 East 42nd Street, New York 17, N.Y.

Memo

TO WIRE MANUFACTURERS

Bakelite Division is also offering new *high-temperature* insulating compounds with UL approval for operation at *plus* 80, 90, and 105 deg. C. Premium quality compounds at a regular price, their smooth surface, free-stripping ability, and high linear extrudability recommend them particularly for radio hook-up wire, lamp ballast wire, lamp holder leads, and machinery wiring. Ask for Kabelitems Nos. 49 and 50.

the **FUTURE** . . . an extension of the present

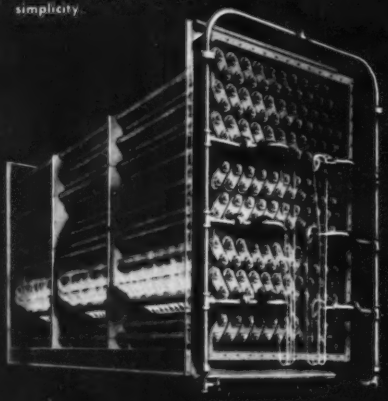


STEAM GENERATORS for every industry designed, engineered and built to meet existing and anticipated needs of a growing economy.

AUXILIARY STEAM GENERATING EQUIPMENT . . .

FOSTER WHEELER

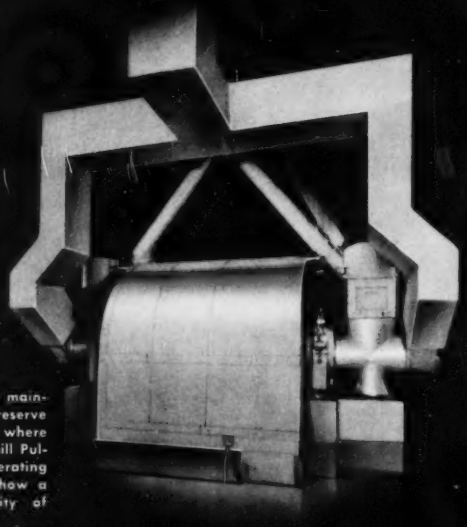
The Foster Wheeler cast-iron, extended surface, steel tube Economizer can be depended on for superior service because it is (1) corrosion resistant, (2) impervious to soot fires, (3) cleanable, and (4) unique in its simplicity.



Over the past several years increased emphasis has been placed on Reheat as a means toward better station heat rate. Foster Wheeler experience in the design and fabrication of Reheaters may be measured partly by the consistently successful operation of one of the world's most efficient power stations where Foster Wheeler Radiant Reheaters and Radiant Superheaters are installed.

TUBULAR AIR HEATERS, WATER WALLS, MULTI-FUEL BURNERS, WASTE HEAT BOILERS

oster Wheeler, first to develop the use of superheated team in this country, designs, engineers, and fabriates convection and radiant type superheaters singly r in combination. SUPERHEAT CONTROL over a wide oad range is also offered as a means of positive and ccurate control of final temperature.



High availability, low maintenance, and large reserve capacity are assured where Foster Wheeler Ball Mill Pulverizers are used. Operating records consistently show a remarkable availability of 99% or better.

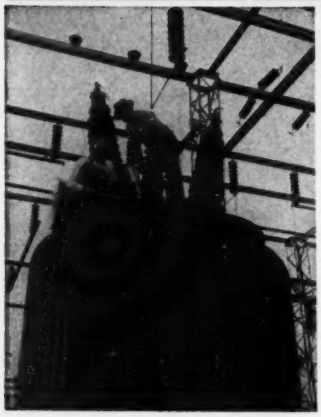
FOSTER WHEELER CORPORATION · 165 BROADWAY, NEW YORK 6, N. Y.

BIDDLE *Instrument News*

- ELECTRICAL TESTING INSTRUMENTS
- SPEED MEASURING INSTRUMENTS
- LABORATORY & SCIENTIFIC EQUIPMENT

NUMBER 7 OF A SERIES

JAMES G. BIDDLE CO., 1316 ARCH ST., PHILADELPHIA 7, PA.



SOUTHERN UTILITY USES "TTR" TRANSFORMER TURN RATIO TEST SET

It is a routine practice of Duke Power Company to ratio power transformers when they are being conditioned for service.

Recently a bank of power transformers being moved to a new location were given a routine check with the Biddle TTR Test Set. The test indicated a fault in one of these transformers. Investigation revealed several shorted turns on the primary. Since the fused turns were not grounded the transformer had operated for some time without failure but with an unbalanced voltage and circulating current in the delta. Having discovered this fault with the TTR Test Set it was possible to repair the transformer without excessive cost or interruption of customer service.

The Biddle Transformer Turn Ratio Test Set is simple to use in the field and insures quick, easy, highly accurate readings. Operated by one man, it is completely self-contained, including 8-volt hand generator, test leads and clamps. Look into this excellent instrument investment and the savings it will mean to your company. Your request will bring by return mail *Bulletin 55W*.

Here's the NEW BIDDLE IMPULSE CABLE FAULT LOCATOR

NOW RATED UP TO 25 KV. WITH THESE IMPROVEMENTS

Higher Voltage—25 kv. increases its usefulness for proof, repair, and service tests on cable installations with voltage ratings up to 15 kv., as well as in cable fault locating.

Improved Performance of Detector—new techniques resulting from field experiences.

Current Measurements Now Included for Proof Testing—permitting the measurement of leakage or incipient fault current during proof testing; helps to determine the condition of cable and other electrical equipment.

Meets Needs for Locating Faults—on duct-installed cable up to 34.5 kv.

The Biddle Impulse Cable Fault Locator was developed primarily for locating faults on lead-covered cable installed in ducts. It has applications also on aerial and buried cable, and has proved highly effective in utility and industrial service. In operation, the set is essentially independent of the fault or its apparent resistance, and depends only on the impulse voltage required to break down the fault.

Equipment now in use in various industries has *scored high* in fault locating. *Keep in touch with us on Cable Fault Locating*—we will gladly consider your problems and give you full benefit of our own progress, development and experience.

For complete information, write for *Bulletin 65W*.

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The bulletins offered here will be mailed at no obligation. Just check this handy form and have it mailed with your name and address.

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We are constantly publishing new technical bulletins on Biddle Instruments. A complete list of our latest bulletins will be mailed you on request, so that you may check it to bring your files up to date.

James G. Biddle Company
1316 Arch Street, Philadelphia 7, Pa.

YOU CAN DO A LOT WITH A LITTLE JENKINS

"It's just what the doctor ordered," say linemen and electricians. Gold Seal Tape tears evenly, quickly . . . will not dry out, peel, or ravel (production is laboratory-controlled to assure lasting "tack" in the friction compound). *Goes further*, too—there's no *waste* with Gold Seal. Produces not only better-taped joints, but more joints per roll. Buy it in handy cartons of 10 or by the roll. Each roll is cellophane-wrapped — *factory-fresh*. Jenkins Bros. (Rubber Div.), 100 Park Ave., New York 17.

Jenkins Bros. also make Diamond Seal Friction and Rubber Tapes which meet both ASTM and Federal specifications.

Gold Seal Tape

FRICTION and RUBBER TAPES

TRADE JENKINS MARK
Jenkins Bros

In either 10-roll cartons or single rolls. Every roll cellophane-wrapped.

MADE BY JENKINS BROS. . . . MAKERS OF FAMOUS JENKINS VALVES

OPERATIONAL RATING —

Better Than 99% PERFECT!
1 Glass Body for Easy Gap Inspection
2 Vent Openings Prevent Corrosion
3 High Speed Multiple Arcing Unit
4 Oxidized Silicon Carbide Valve Element

Crystal Valve Ventilated Spark Gap Arresters have built an amazing record of operating efficiency — better than 99% perfect! This rating has been established over 16 years of operation . . . under adverse conditions . . . in thousands of installations.

In addition to high speed, efficient protection provided, elimination of radio interference and freedom from gap electrode corrosion are plus features. Other advantages include high speed multiple arcing unit and oxidized silicon carbide valve element for fast operation.

Ventilated spark gap structure permits movement of air in and out of spark gap housing, and circulation within housing. Air movement prevents moisture accumulation and danger of corrosion.

Write Dep't 1709 for new folder containing complete data on Crystal Valve Ventilated Spark Gap Arresters.

ELECTRIC SERVICE MANUFACTURING CO., PHILA. 32, PA.

CRYSTAL VALVE

LIGHTNING ARRESTERS

Principles of Ventilated Spark Gap Arresters

by

J. R. McFarlin, Vice President
ELECTRIC SERVICE MANUFACTURING CO.

The failure rate of modern lightning arresters from all causes is relatively low; of the small percentage that do fail one of the causes frequently has to do with the accumulation of moisture in the spark gap chamber, this followed by corrosion of the spark gap electrodes. The obvious means to correct this condition is to prevent accumulation of moisture in the spark gap chamber; this may be accomplished by ventilation.

Ventilation of lightning arresters is nothing new; 60 or 70 years ago arrester units for outdoor service were generally installed in wood boxes provided with hinged doors; with such construction these were completely ventilated and rarely were the units afflicted with corrosion due to moisture. Ventilation of the modern porcelain housed lightning arrester is not so simple, but can be and has been done for many years.

Some 35 years ago Electric Service Manufacturing Company developed and manufactured multi-gap resistance type arresters, the elements of which were enclosed in a porcelain housing which was vented at the lower or ground end; these, so far as we know, were entirely free from moisture trouble.

Some 16 years ago manufacture of Crystal Valve lightning arresters with ventilated spark gap structures was begun; these arresters have been sold throughout the world and to date not a single case of moisture trouble has come to our attention.

These arresters for 3.0 KV service are made in a 1-piece porcelain body; for 6.0 to 15.0 KV, inc., they are made in a composite body employing glass for housing the spark gap assembly and porcelain for housing the valve element; an illustration of the latter type appears on this page. The spark gap element of these higher voltage units is ventilated by means of openings between the glass and porcelain housings—see "2" in illustration; for the 3.0 KV units ventilation is provided by shielded openings in the base seal.

In both cases this ventilation provides free access of air in and out of the spark gap housing and circulation within the housing; any moist air that may be breathed into the housing due to decreasing ambient temperature will be breathed out when the ambient temperature increases; none of it will be retained and accumulated. The result is that the interior of the housing is maintained in a dry condition and the spark gap elements are kept dry and clean and therefore are not subject to deterioration or corrosion from moisture.

(Advertisement)

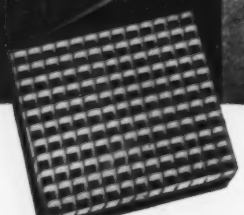
For Distinctive Shadowless Lighting . . .

CORNING FOTA-LITE

There's no denying the dramatic effect of a completely luminous ceiling whether for executive offices, stores, or commercial buildings. But, it must also be functional—provide a high level of illumination with low panel brightness. The unique properties of Corning Fota-Lite make it perfect for this type of lighting.

Fota-Lite gives you all the advantages of louvered lighting and flat glass combined. Vertical light is almost unrestricted, yet the diffusing louvers keep brightness level low—give the glass the appearance of plain opal. Non-color selective, Fota-Lite gives better quality light—transmits the true color of the light source.

Strong, light in weight and free of warpage, Fota-Lite is easily installed in shallow, dust-tight fixtures. And, unlike usual louvering materials, Fota-Lite can be cleaned with the wipe of a cloth—does not change color, scratch or attract dust. Available in widths up to 20" and lengths up to 49", Fota-Lite may be used in almost any application where louvering is desired.



A remarkable new lighting medium, Fota-Lite controls the 45° cutoff by louvers photographically produced in a thin (1/8") panel of glass. The tiny opal louvers are part of the glass itself —will not deteriorate with age or weathering—save metals—lower maintenance costs.

CORNING GLASS WORKS, CORNING, N. Y.

Corning means research in Glass

PYREX

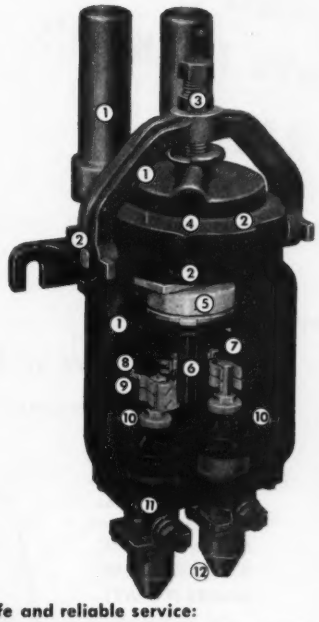
1851 • 100 YEARS OF MAKING GLASS BETTER AND MORE USEFUL • 1951

USE G&W OIL FUSE CUTOUTS

For Disconnecting and Protecting Primary Circuits in any Location

Explosion-proof

Load Break Oil Switching or Short Circuit Fusing



Here are 12 reasons for safe and reliable service:

1. Rugged, pressure-tight, ALL STEEL, tank, cover, cover clamp and expansion chamber. Cover clamp hinges on stainless steel pins.
2. Cover and cover clamp interlocked to prevent withdrawal or insertion of fuse carrier except in the OFF position.
3. Large screw and locknut insures perfectly tight gasketed joint between cover and tank in either ON or OFF position.
4. Cover easily switched OFF and ON with removable rod. Readily adapted for gang operation. Sleet and ice will not prevent operation.
5. Higher voltage ratings have porcelain insert between fuse chamber and cover.
6. Short circuits quietly and definitely cleared in ½ cycle.
7. Simple inexpensive fuse link is easily replaced.
8. Fuse link and all live contacts are well below the oil level. Oil level is not critical.
9. Beryllium copper spring contacts carry current without excess heating and are not subject to fatigue.
10. Unit detachable compound-filled potheads seal cables and prevent migration of oil from tank. Porcelain bushings protect cable ends against surges.
11. Permanently oil-tight "Resistoyl" gasketed joints.
12. Interchangeable cable entrances at bottom of cutout. Permit logical cable training with minimum wall space.

Write for Bulletin CA50—Ratings, Dimensions, Prices.

Use G & W Cable Accessories for
TERMINATING
FUSING—SWITCHING
SPLICING—CONNECTING

POTHEADS

Trouble-Free Cable Terminations

Capnut Style Disconnecting Straight Through

Write for Bulletin AB51
Type "ST-SODERTITE"

Write for Bulletin AA50

LOAD BREAK OIL SWITCHES

600, 7,500, 15,000 and 23,000 Volts.

400 Ampere Load Break

Rocker Arm Links in Many Switching Arrangements.

CABLE BOXES

Air or Oil Filled

Fuses, Links or Direct Connection

Many Sizes, Styles, Ratings

UNIT SPLICING KITS

Packaged Materials for Properly Designed Joints for all Types of Cables

Write for Bulletin JS0

G&W ELECTRIC SPECIALTY COMPANY
7780 DANTE AVENUE • CHICAGO 19, ILLINOIS, U.S.A.
Representatives in principal cities. In Canada, Powerlite Devices, Ltd., Toronto

You can *Save* space and *Reduce* inventories with TRIANGLE'S "DUAL-RATED"

This **ONE WIRE** will cover your **RH *and* RW WIRE** requirements

RH—RW?—forget them! Triangle's "Dual-Rated", Type RHW meets the physical and electrical requirements of each one of those types. Think of the money you can save on reduced inventories. Think of the space you save. Think of the confusion and headaches you avoid.

WHERE IT'S HOT— "Dual-Rated" is Underwriters' Laboratories approved as Type RH at 75°C., dry locations... *or*

WHERE IT'S WET— "Dual-Rated" is Underwriters' Laboratories approved as Type RW at 60°C., moist locations.

EVEN THOUGH IT'S BETTER TRIANGLE COSTS NO MORE!

TRIANGLE CONDUIT & CABLE CO., INC.
NEW BRUNSWICK, NEW JERSEY

IT MUST BE RIGHT

"Glazon" Building Wire • Bare Wire • Armored Cable • "Glazon" Non Metallic Sheathed Cable • Service Entrance, Service Drop, Varnished Cambric, Braided or Leaded, Thioprene Trench, Power and Parkway Cables • Rigid Conduit Hot Dipped Galvanized • Electric Metallic Thin Wall Conduit • Flexible Steel Conduit

KEY . . . YOUR OPERATIONS FOR SAFETY

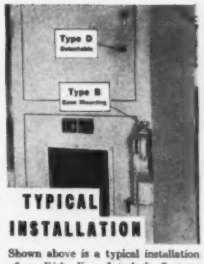
Kirk Key Interlock Systems prevent the authorized person from doing the unauthorized thing! Added safety for your installation and equipment is provided by this device which is applied to two or more movable parts, preventing or allowing movement of one part only when another part is locked in a predetermined position. Unlimited operating schemes can be arranged in electrical installations, processing systems, fluid and pneumatic systems, etc., from combinations as shown, or multiple units of any one of them. Individual locks are mechanical and meet basic mounting requirements. Following are descriptions of the 3 types shown above:

1. **TYPE F**—For flat mounting—Can be mounted on any protective device.

2. **TYPE D**—Detachable....Can be mounted on cell door, gate or compartment. One key retained with door locked open....other key can be retained by operator or used to operate other devices.

3. **TYPE B**—For base mounting—Can be mounted on handle of disconnecting device....Key released when lock is open.

Please write for Bulletin No. 1725 for full description, applications and typical schemes for R&IE Kirk Key Interlocks



TYPICAL INSTALLATION

Shown above is a typical installation of a Kirk Key Interlock System. Fuse compartment can only be opened when interrupter switch is locked open.

RAILWAY and INDUSTRIAL ENGINEERING CO., Greensburg, Pa.

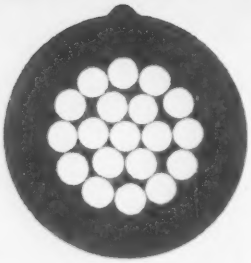
IN CANADA—EASTERN POWER DEVICES LIMITED, TORONTO

AN I-T-E SUBSIDIARY

The Check List

- CONDUCTOR SUPPORTS CLAMPS AND FITTING
- DISCONNECTING SWITCHES INDOOR AND OUTDOOR
- HORN GAP SWITCHES
- INTERRUPTER SWITCHES
- CUTOUTS AND THERMO-RUPTERS
- DISTRIBUTION EQUIPMENT
- SWITCH OPERATING MECHANISMS
- SUBSTATIONS
- OPEN OR ENCLOSED ISOLATED PHASE HEAVY DUTY BUS
- KIRK INTERLOCK SYSTEMS
- AUTOMATIC SWITCHING EQUIPMENT
- METAL CUBICLES
- TESTING DEVICES

WHY OKONITE'S STRIP INSULATING PROCESS



GIVES UNIFORM WALL THICKNESS — PERFECTLY CENTERED CONDUCTORS

Hit or miss centering of conductors within the insulating wall is eliminated by the strip process. In the first place, perfectly uniform wall thickness is assured because the thickness of the calendered strips is electro-magnetically measured before application. As a result, conductors are automatically perfectly centered.

Furthermore, since the insulation is encompassed in a continuous metal mold during vulcanization, swelling is prevented and a more dense insulation secured.

Insulation is applied in strips of predetermined thickness

Okonite is the only cable manufacturer using the strip insulating process as a standard procedure. Of all types of processing and applying rubber compound insulations, NONE can compare with the strip process for *assuring circuit security*.

Okonite is uniquely unbiased in making this statement, because *this company alone* is fully equipped to use all other available methods—i.e. extrusion, latex dip and continuous vulcanization. You can have your choice. Yet, year after year, the unparalleled performance of strip insulated cables strengthens the proof that no other insulating method even approaches the strip process. Its greatest tribute is that despite higher initial cost, engineers all over the world continue to demand it for cables that *must not fail*. And over the years, the trouble-free service obtained from Okonite strip-insulated cables more than repays the added cost.

The logical reasons for the superiority of the strip process are briefly explained on these pages. Compare its advantages and judge for yourself.

AVOIDS EXCESSIVE BREAKDOWN OF RUBBER

In order for rubber insulations to be applied by ordinary extrusion, the compound must be softened by prolonged "breaking down" of the rubber hydrocarbon. Thus treated, the material never again regains fully its natural characteristics; its original vitality has been deadened.

In Okonite's strip insulating process, the calendered strips, however, are applied in a much firmer and tougher form. The insulating compound does not have to be excessively broken down. Better physical, electrical and aging qualities result.

OKONITE

assures unequalled service– highest dielectric strength– in electrical cables

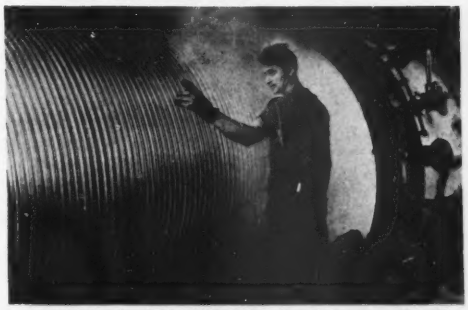
Every foot of insulation is inspected before application

PERMITS TESTING AND INSPECTING *BEFORE* APPLICATION

One of the greatest virtues of the strip process is that the calendered strips can be carefully inspected and electrically tested throughout their entire length *before* application to the conductor. Such a procedure is of course impossible in any other type of application.

ASSURES UNIFORM VULCANIZATION AND BOND

1. Use of the metal mold assures uniform vulcanization throughout the entire length of the cable.
2. Insulation and sheath are vulcanized together simultaneously to produce a permanent bond.
3. Avoids multiple vulcanization that shortens the life of rubber compounds.



Insulation is vulcanized under pressure in continuous metal mold

PROOF OF THE PIE

No other cable manufacturer gives such intensive, super-voltage a-c and d-c tests for your protection. With ordinary cables, the rate of production failure under such tests would be ruinous.

Okolite-Okoprene, however, is built from the conductor out with an extra margin of dielectric and mechanical strength. Research, premium materials, and rigid inspection controls are all of course important. But the use of the unique Okonite strip process probably contributes most importantly of all to the long life and reliability of the Okolite-Okoprene cable you buy.

For complete information on how the Okonite strip process assures stronger insulation, uniform walls, perfectly centered conductors, uniform vulcanization, and permits testing prior to application, write for Bulletin EW-1053 to The Okonite Company, Passaic, N. J.

Super-voltage proof tests are severest in entire industry

DO YOU KNOW that in Okolite-Okoprene cables the Okolite insulation and Okoprene sheath are applied in the same operation and vulcanized simultaneously in a metal mold?

THE BEST CABLE IS YOUR BEST POLICY

OKONITE SINCE 1878 *insulated wires and cables*

"...and the laundry isn't started"

That laundry should be drying. But, Mrs. Burns' new washer stopped dead just as she was putting in the first load of clothes. Her opinion of the machine is definitely not complimentary.

The Westville Electric Company will be over soon and then the explanations will start — perhaps the manufacturer cut corners on electrical insulation . . . perhaps he used an insulation that can't stand vibration and wear.

Mrs. Burns isn't interested in explanations. She wants service. And she isn't much different from you when *you* buy electrical insulation.

Join the ranks of foremost electrical equipment manufacturers who use BH "649" Fiberglas Tubing and Sleeving (Patent Pending) for its superior electrical insulation qualities.

BH "649" will take all kinds of hard punishment. Knot it, then loosen it — twist it 'round and 'round — rub it back and forth on the edge of your desk. Then examine BH "649" — the tough coating will be undamaged, because no hardening varnish or lacquer is used. There is no flaking, peeling or cracking.

Resistance to chemicals, oil and water is unusually high. Age has little effect on its physical and dielectric properties. Physical and electrical properties unimpaired after exposure to sub-zero temperatures. Retains its remarkable flexibility in these heat endurance tests — 15 minutes at 425-450° F., 24 hours at 302° F., 1500 hours at 220-230° F. Special processing prevents fraying when it is cut and handled — a big help for speedy installation.

BH "649" is one of a family of BH insulations, each designed to meet particular conditions in service. Give us a few facts about your requirements, product, operating temperatures, voltages. We will furnish production samples for testing. Address Dept. W-5.

Bentley, Harris Manufacturing Co.
Conshohocken, Pa.

BH *Fiberglas** SLEEVINGS

*BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2393530). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp.

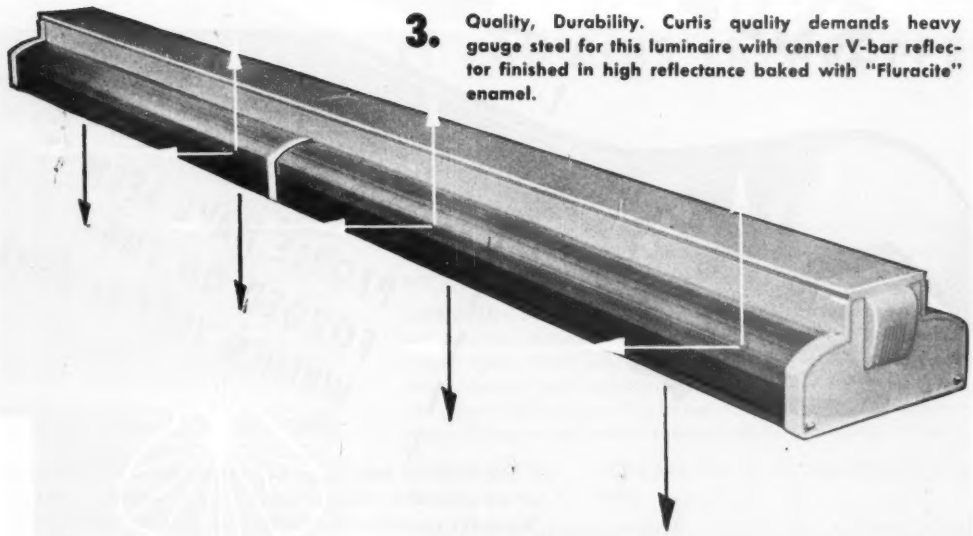
getting down to brass tacks on industrial lighting . . . . . .

means assessing the functional value of a luminaire. For example, here is the **CURTIS "INDUSTRIALIST"**, a scientifically designed lighting unit which, through careful engineering, provides these basic factors:

1. Direct-Indirect illumination. As shown by the typical curve, the indirect component distributed through fine ribbed polystyrene plastic distributes light to the ceiling and reduces severe brightness contrast. The direct component provides high levels of uniform illumination on working surfaces.

2. Ease of Maintenance. The open design of the "Industrialist" facilitates maintenance . . . side panels are quickly and easily removed for cleaning without use of tools.

3. Quality, Durability. Curtis quality demands heavy gauge steel for this luminaire with center V-bar reflector finished in high reflectance baked with "Fluracite" enamel.



Typical Curve

4. Ease of Installation. Close ceiling or pendant mounting is available either for individual units or continuous lines.

5. Flexibility. Curtis industrial luminaires are designed for use with 4, 6 and 8' fluorescent lamps.

CURTIS
LIGHTING, INC.
6135 W. 65th Street
Chicago 38, Illinois

Send coupon today for complete information.

CURTIS LIGHTING, INC.
Dept. E18-14, 6135 W. 65th St.
Chicago 38, Illinois

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

45 MILLION TIMES "CRESCENT" HAS HELPED SELL THE WRENCH!

BECAUSE 45 MILLION PEOPLE HAVE SEEN IT FORGED ON THE WRENCH THEY BOUGHT

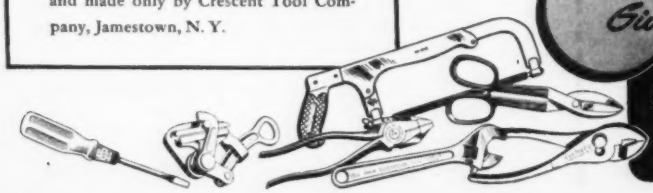
In the minds of millions of tool buyers the name "Crescent" on an adjustable wrench means "this is a quality wrench." When any product...be it tools or tea...has sales of 45 million, it must be good *from every angle.* Crescent is proud of this record...and because of this record, takes extra pains in manufacture to maintain the high quality which has long been synonymous with the names...CRESCENT and CRESTOLOY.

CRESCENT TOOL COMPANY, JAMESTOWN, N. Y.

"Crescent" is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by Crescent Tool Company, Jamestown, N. Y.

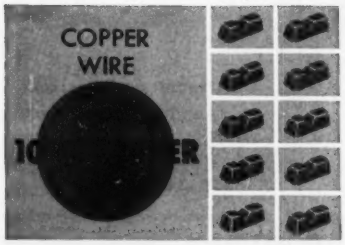
CRESCENT TOOLS
Give Wings to Work

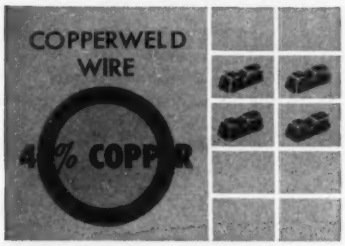
Sign of the Artisan
Symbol of Excellence

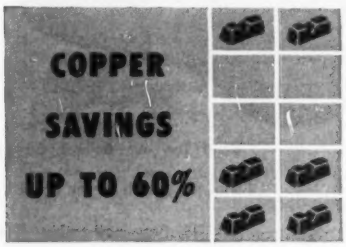


COPPER IS VITAL TO NATIONAL SECURITY—CONSERVE IT

Question: HOW CAN I [illegible] COPPER?







Answer: USE Copperweld TRADE MARK -IT CONTAINS LESS COPPER

Study these Copperweld Advantages:

CONDUCTIVITY . . . Copperweld* Power Conductors assure adequate electrical conductivity and use the minimum amount of copper necessary to do this job.

STRENGTH . . . The protected steel core of each Copperweld Wire provides the permanent high strength that permits the stringing of longer spans. This means less poles, hardware and accessories are needed thereby reducing construction costs. Thus, by taking advantage of Copperweld's ruggedness, the use of oversized copper conductors to obtain necessary mechanical strength can be eliminated.

PERMANENCE . . . Copperweld has all the rust-resistance of solid copper yet uses less copper.

TIME AND COST REDUCTIONS . . . Each year you'll save on repairs and maintenance because of Copperweld's unique combination of advantages. Man-hours and copper—both vital to you and to the National Security Program—are conserved and used with greater efficiency when you install Copperweld Power Conductors.

*Trade Mark

COPPERWELD SAVES COPPER

Write today for your copy of the Copperweld Engineering Data Book

COPPERWELD STEEL COMPANY ***Glassport, Pa.***

SALES OFFICES IN PRINCIPAL CITIES

Copperweld TRADE MARK DEPENDABLE POWER CONDUCTORS

MADE BY THE EXCLUSIVE COPPERWELD MOLTEN-WELDING PROCESS

due to improved
more economical production methods
and rapidly increasing volume:

Prices reduced 10%

for high-quality lighting
with

GUTH SEELUX

- 3 ring, open-bottom, for silver bowl lamps
- finest indirect lighting
- lifetime beauty, efficiency
- practically no maintenance
- an outstanding example of functional simplicity and beauty

HEATPROOF ALZAK FINISH**
is not discolored or affected by lamp heat.

DUSTLESS OPEN BOTTOM
minimizes cleaning—dirt falls through.

SILVERBOWL LAMP
provides built-in reflector. Peak efficiency is automatically restored; when lamp is replaced, you have a new reflector.

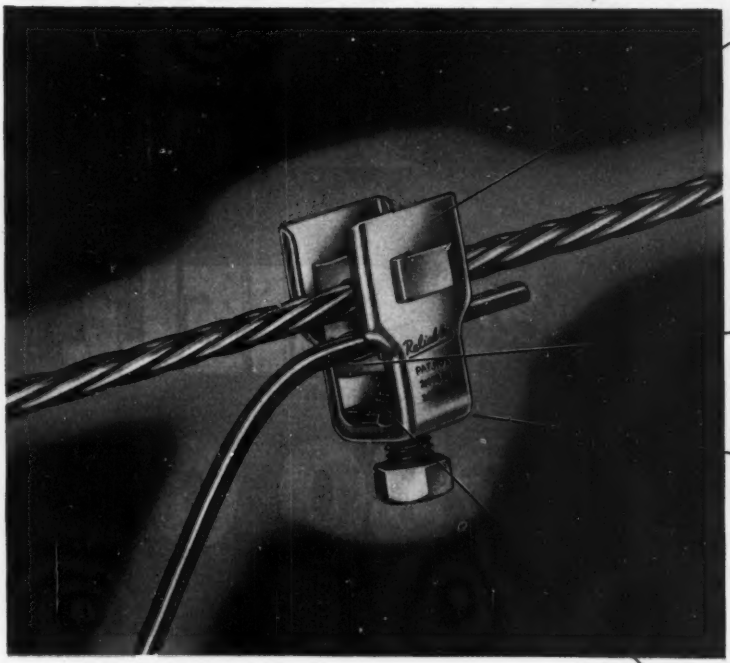
Send for our Bulletin 864-H with full details on the SEELUX, SEELUX Plus and other fine GUTH Incandescent Indirects.

*Ⓡ and Patents Pending

**Ⓡ and Patented, Aluminum Co. of America

Guth LIGHTING
THE EDWIN F. GUTH COMPANY / ST. LOUIS 3, MISSOURI
Leaders in Lighting since 1902

Accents on Accuracy



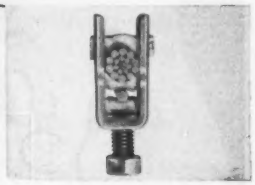
in the manufacture of

FLIP-ON TAP CLAMPS

Rugged, Reliable connections are assured with these precision Flip-On Tap Clamps. Accurately gauged threads and spacers always work smoothly—snug-up tighter, and then stay tight—while large bearing surfaces protect the conductors from damage. Carefully designed and carefully made, all parts are accurately heat treated. Their lighter construction of aluminum alloy reduces vibration fatigue. And where dissimilar conductors are used, spacers are provided with both copper and aluminum faces—to prevent electrolytic corrosion. Spacers accurately align conductors under screw pressure so that the joint gets the full benefit of direct (1:1 ratio) pressure. Reliable's accent on accuracy assures quick and easy installations—rugged, Reliable performance.

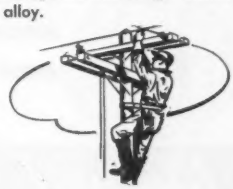
1. Precision dies and faultless equipment produce rugged body — wall slots are accurately parallel for easy, reliable pressure-clamping.

2. Exact manufacturing techniques assure these carefully engineered spacers give firm, reliable connections — without damaging conductors.



3. Nut is staked in body before tapping. Four full threads are continuous. Aligning fixture insures accuracy of direction. Pressure on conductors is directly under screw in opposite directions (ratio 1:1).

4. Accurately controlled electric furnaces bake long life and reliability into this tough aluminum alloy.

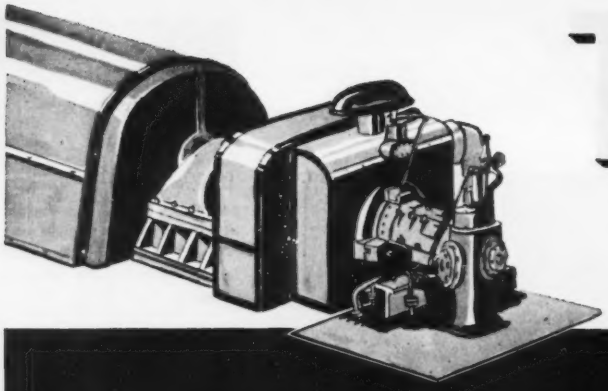


Reliable ELECTRIC COMPANY

3145 CARROLL AVENUE, CHICAGO 12, ILLINOIS

OVER 40 YEARS OF SERVICE TO THE UTILITIES

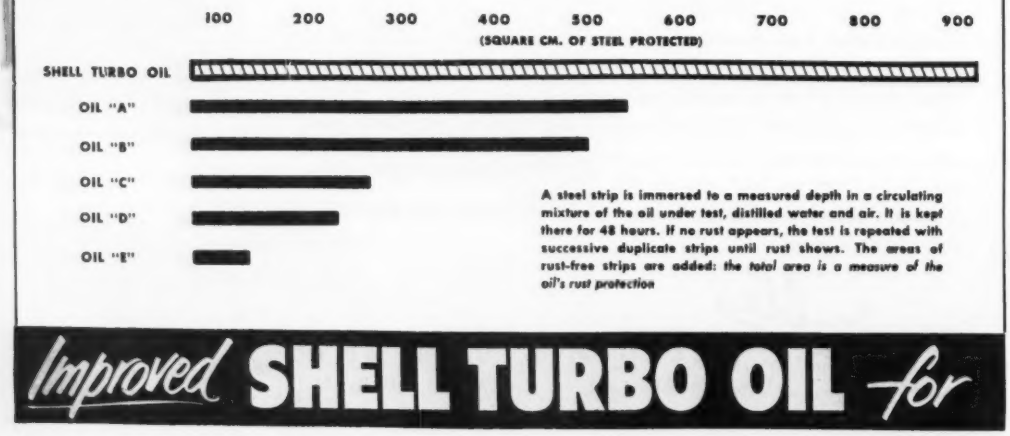
POWER-LINE CONNECTORS AND CONSTRUCTION SPECIALTIES



Today's

Improved SHELL TURBO OIL

"LOOK AT THESE RUST-PROTECTION FIGURES"



A steel strip is immersed to a measured depth in a circulating mixture of the oil under test, distilled water and air. It is kept there for 48 hours. If no rust appears, the test is repeated with successive duplicate strips until rust shows. The areas of rust-free strips are added: *the total area is a measure of the oil's rust protection*

Improved SHELL TURBO OIL for

Surest Safeguard

for MAJOR TURBINE INVESTMENT

The one lubricant that provides this

outstanding 5-way protection

Because of the tremendous responsibility entrusted to operators of large steam turbines, and because of the heavy investment each unit represents, Shell Oil Company has been concentrating on a lubricant research project of primary importance to utility and industrial executives.

The product now offered, Improved SHELL TURBO OIL, exceeds *every* accepted specification for premium turbine lubricants. It offers these five outstanding improvements:

1. **Highest known rust protection**—An entirely new combination of rust inhibiting additives effectively retards the formation of rust—an action which with proper maintenance will continue for the life of the turbine. Rusting problems are reduced to the very minimum in any turbine protected by Improved Shell Turbo Oils.

2. **Outstanding Oxidation Stability**—Improved Shell Turbo Oil contains the same time-proved anti-oxidant which has compiled such an extraordinary record of oxidation stability in the original Shell Turbo Oil. Service records for turbine units of all sizes . . . many operating for 10 to 13 years . . . show complete stability with respect to oxidation and sludge formation. In each of these units the oil gives every indication of matching the operating life of the turbine itself.

3. **Anti-foaming**—With the effective anti-foam agent now in Shell Turbo Oil, air entrainment can be tolerated for considerable periods, thus avoiding unscheduled shutdown.

4. **Excellent Emulsion Characteristics** — Improved Shell Turbo Oil provides the greatest protection against rust and oxidation yet achieved. Moreover, this protection is attained without any tendency to form objectionable water emulsions in service.

5. **Protection against wear**—The specially developed rust inhibitor used in Improved Shell Turbo Oil has the added faculty of reducing surface wear . . . adding to the protection afforded by the Oil itself. Because of this "anti-wear" effect, Shell Turbo Oil provides a welcome margin of safety for the bearings and gears during the critical starting and stopping periods.

Samples and complete information on the Improved Shell Turbo Oil will be sent promptly on receipt of your letterhead request. Address: Shell Oil Company, 50 West 50th Street, New York 20, N.Y. or 100 Bush Street, San Francisco 6, California.

SHELL

central station and industrial turbines

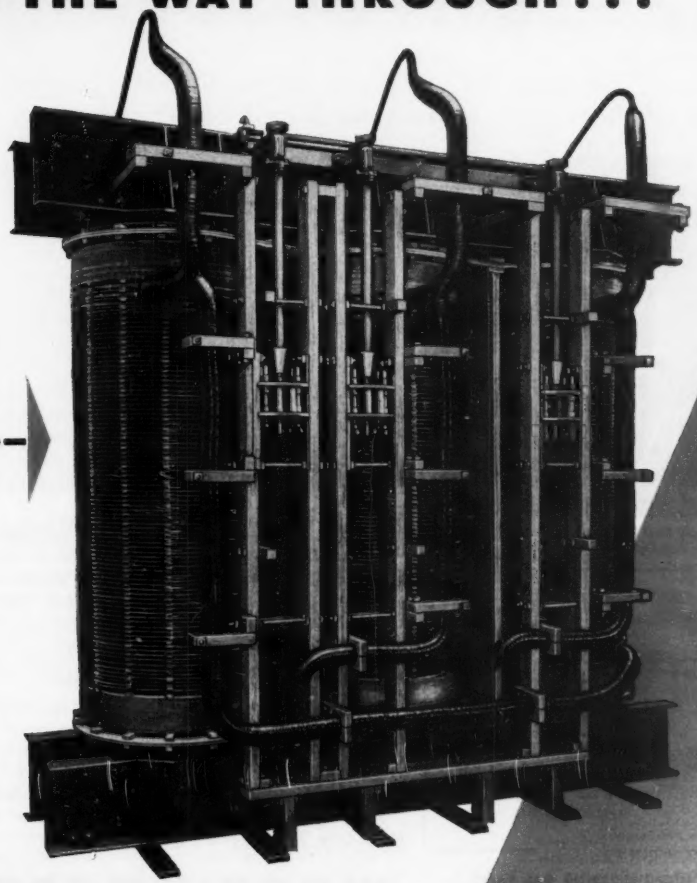
Wagner Power Transformers have a reputation for quality—inside and out—established through sixty years of service to the power industry and proved by service records from the field, dating back to the early 1900's. They are liberally designed and are built with painstaking care to enable them to give years of uninterrupted service. Use of highest quality materials and rigid inspection and tests have made Wagner Power Transformers "the choice of leaders in industry."

Wagner maintains thirty-one branch offices, located in principal cities, for quick, convenient engineering service and consultation. Consult the nearest branch for competent advice on your next transformer installation.

Wagner Electric Corporation
1891 1951

POWER TRANSFORMERS

ALL THE WAY THROUGH . . .



Wagner Power Transformer Elements are particularly outstanding because of their inherent strength and stability and because of their compact design and careful construction. They have sufficient capacity to not only carry their normal load but to be able to handle an overload when the emergency arises.

That's why Wagner Transformers have established records for continuous service and long life in all types of industrial plants and transmission lines. The complete story of Wagner Power Transformer construction is told in Bulletin TU-181. Write for your copy.

WAGNER ELECTRIC CORPORATION

6456 PLYMOUTH AVE. • ST. LOUIS 14, MO., U. S. A.

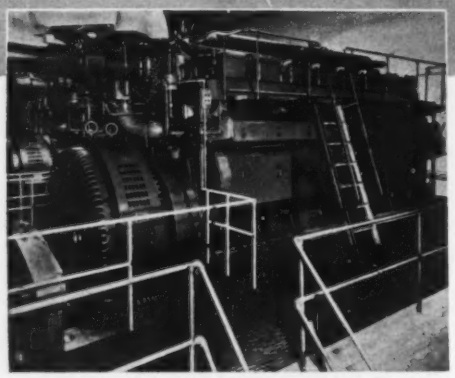
ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES

AUTOMOTIVE BRAKE SYSTEMS – AIR AND HYDRAULIC

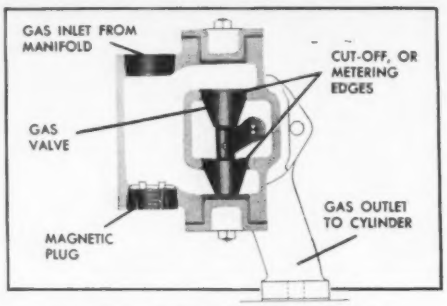
BRANCHES IN 31 PRINCIPAL CITIES

They're Handling Expanding Power Loads The Fast, Low Cost Way:

Iowa Utility Company, Like So Many Others, Uses Worthington Dual Fuel Units For Uninterrupted Service On The Cheapest Fuel Available



A Worthington Supercharged Dual Fuel Engine in the Oskaloosa plant — part of the Iowa Power And Light Company System.



WORTHINGTON MICRO-METERING GAS VALVE
One for each cylinder

Used on Spark Ignition and Dual Fuel Engines — Governor controlled — Individually adjusted.

Assures: — Equal cylinder loading — Smooth running at all loads — Better speed regulation — Lower maintenance.

Full load operation, 24 hours a day, is routine performance for Worthington Dual Fuel Engines. They're designed and built to do just that — and they're doing it for power companies in communities all over the world.

They're saving money for their users every day, too, because of their Worthington-pioneered dual fuel feature that enables them to operate on gas or oil, or any combination of these fuels. Also, without losing load, they can instantly be changed over from one fuel to the other.

When gas is your fuel, only a very small amount of pilot oil is needed for ignition. Micro-metering valve (see drawing) on each cylinder provides equal distribution of gas for smooth, steady operation. Supercharging assures maximum economy through high thermal efficiency with either fuel.

BESIDES FUEL SAVINGS—

Lubrication and maintenance costs have been cut to a minimum through an effective system of "hot-spot" lubrication, according to users of Worthington Dual Fuel Engines. Why not get the whole story that proves *there's more worth in Worthington?* Write to *Worthington Pump and Machinery Corporation, Engine Division, Buffalo, New York.*

WORTHINGTON

E1-2

YOUR PARTNER IN POWER PROGRESS

WORTHINGTON-BUILT AUXILIARIES

Diesel engines, 150 to 3,520 hp . . . gas engines, 175 to 3,520 hp . . . dual fuel engines, 225 to 3,290 hp.

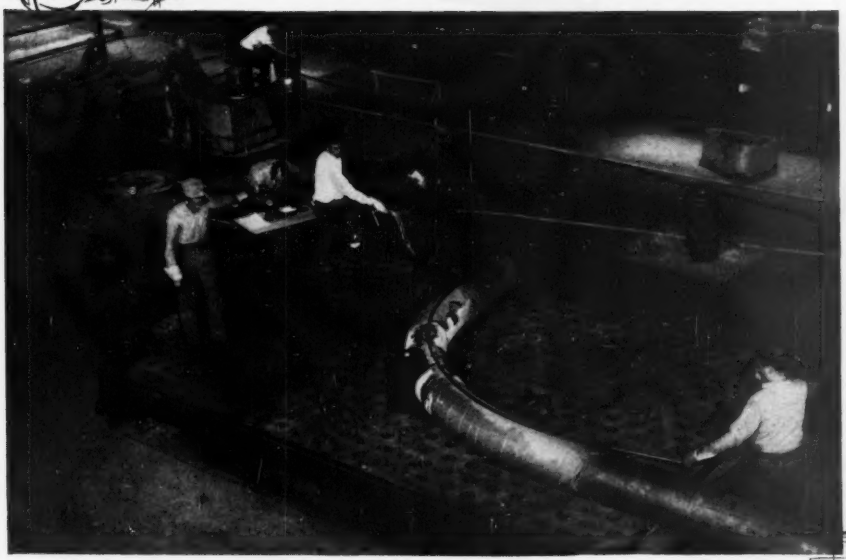
Balanced Angle Compressors

Oil Transfer Pumps

Cooling Water Circulating Pumps

Evaporative Type Engine Water Cooler

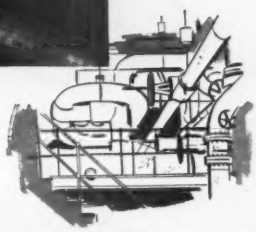
From interpretation to installation . . .



GRINNELL PREFABRICATED PIPING

assures greater customer satisfaction through its five-point program of

Quality Control



The bending operation illustrated above is an example of Grinnell QUALITY CONTROL *in action* . . .

The tubing shown is made from a chromium alloy steel forging, turned and bored. Outside diameter is 14¾ inches; wall thickness 2⅜ inches. Temperatures of the tubing within the bending furnace were maintained and controlled within 20°F of specified temperatures. Bending was done with such skill and rapidity as to permit a temperature drop of only 100°F at the inside surface of the tubing. Maximum thinning was only .06 inch.

Designed for a central station power plant to accommodate 1500 PSI and 1050°F, this is typical of Grinnell's engineering knowledge which assures prefabricated piping of the right kind — for all types of installations no matter how complex.

QUALITY CONTROL is the result of Grinnell's 100 years of practical experience in the field of piping. Delivery of prefabricated piping subassemblies to exacting engineering requirements which meet all governing code requirements is assured by Grinnell Quality Control, which includes:

- Interpretative engineering
- Metallurgical research
- Specialized facilities
- Skilled personnel
- Rigid inspection

ECONOMY of specifying Grinnell prefabricating piping results from:

- One source for design, interpretation and fabrication
- Coordination of shop production under ideal conditions
- Elimination of waste by paying only for finished material delivered
- Reduction in field erection time

Write for the booklet, Grinnell Prefabricated Piping.

GRINNELL

WHENEVER PIPING IS INVOLVED

GRINNELL COMPANY, INC., Providence, R. I. Warehouses: Atlanta • Billings • Buffalo • Charlotte • Chicago Cleveland • Cranston • Fresno • Kansas City • Houston • Long Beach • Los Angeles • Milwaukee • Minneapolis • New York Oakland • Philadelphia • Pocatello • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane

1873 THOMAS INSULATORS our 78th year RELIABILITY 1951

DEMAND *Proof* OF PERFORMANCE

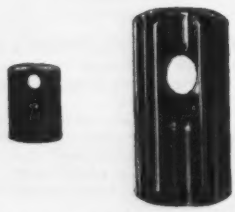
1907

● Fig. 1—In 1907, THOMAS was FIRST with the CAP-AND-PIN Suspension Insulator.

1951

● Fig. 2—In 1951, THOMAS is STILL the Standard of Comparison.

● Fig. 3—Typical "Quiet-Type" Insulator*.



● Fig. 4—Guy-Strain Insulators

Let us repeat, "All insulators are not alike". To make an insulator that will do its job the trouble-free way . . . over a span of many years . . . requires EXPERIENCE. Thomas has that experience.

Since the beginning of the Electrical Industry, Thomas has consistently kept pace with the Industry's astonishing growth. Two early mileposts in our progress come to mind.

In 1893, all of the porcelains used in the lighting arrangement for the World's Fair at Chicago were Thomas.

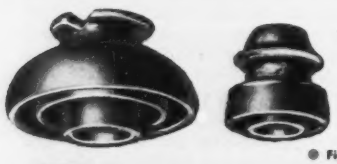
In 1907, Thomas designed and made the first Cap-and-Pin Suspension Insulator. UNITS INSTALLED THAT YEAR ARE STILL GIVING TROUBLE-FREE SERVICE AFTER 44 YEARS OF CONTINUOUS OPERATION.

More recently, Thomas pioneered and patented a complete line of "Quiet-Type"* Insulators which are guaranteed to eliminate insulator radio interference.

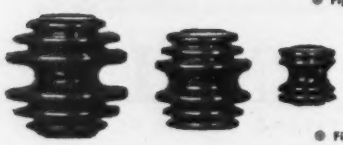
These are among the many Thomas "Firsts" and contributions which have helped the Electrical Industry reach its present position.

TODAY, in our 78th year, we are ready with improved facilities and increased capacity to meet the most exacting needs of the Industry. After all is said . . . it's still quality that counts plus proper designing, precision manufacturing . . . and PROOF OF PERFORMANCE. Why gamble?

* Patent No. 2154387



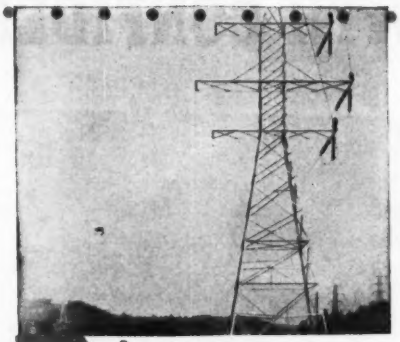
● Fig. 5—Pin-Type Insulators



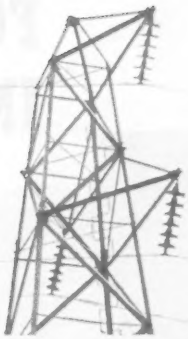
● Fig. 6—Spool Insulators.

ENGINEERS, MANUFACTURERS AND DESIGNERS SINCE 1873

FOR SUPERIOR INSULATOR QUALITY



1931 Fig. 7—2660-foot span of 69-mile, 132-kv line equipped with Thomas Insulators installed in 1931.

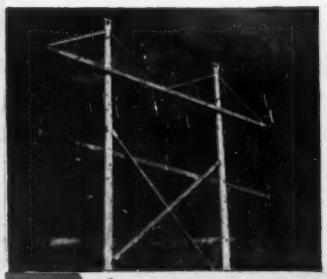


1907 Fig. 8—Central California line on which Cap-and-Pin Insulators were first used in 1907.

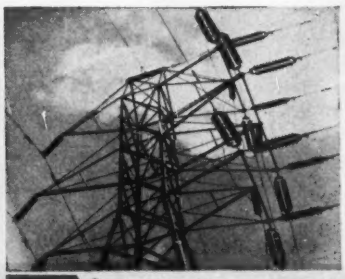
1938 Fig. 9—Large Western 230-kv line using 50,000 Thomas Insulators installed in 1938.

Specify Thomas Insulators - The Best by Line Test

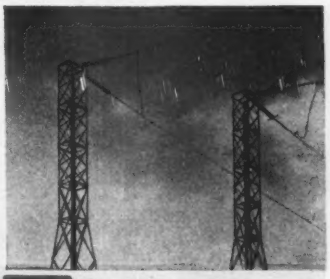
The R. Thomas and Sons Company is a manufacturer and designer of all types of porcelain insulators . . . pin-type, switch, suspension, spools, guy-strain, bushings and special high-voltage porcelain. In addition, Thomas supplies associated line hardware, clamps, fittings, preformed armor rods, and so on.



1948 Fig. 10—43,000 Thomas Insulators are installed on this 230-kv, 189-mile line.



1949 Fig. 11—5,000 Thomas Insulators make certain that this 132-kv, 14-mile line will give satisfactory service for decades to come.



1950 Fig. 12—On right-angle towers, Thomas Insulators have the stamina that assures long life and trouble-free performance.

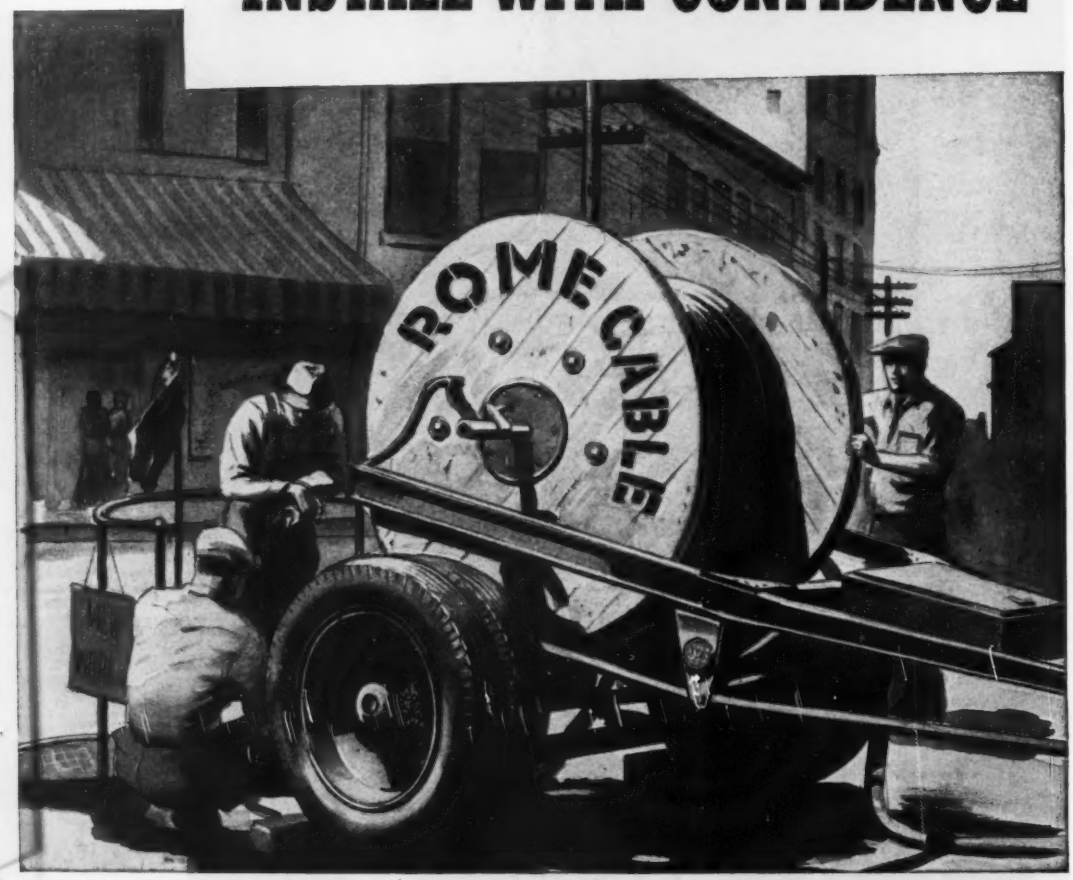
The R. Thomas and Sons Co.

LISBON, OHIO

NEW YORK CHICAGO

Sales Representatives: E. B. Anderson Co., *Detroit* • Paul Berry, *Oklahoma City* • Ken H. Best, *Seattle* • Butler & Land, *Dallas* • R. E. Cunningham & Son, *Los Angeles* • Electric Supply Co., *Albuquerque* • Engineer Sales Corp., *St. Petersburg* • R. F. Hamilton & Associates, *Denver* • R. H. Harper, *St. Louis* • Geo. E. Henn Company, *San Francisco* • W. J. Hugo, *Minneapolis* • Leiser & Company, *Philadelphia* • Lynn Elliott Company, *Houston* • W. C. Milburn, *Chattanooga* • John G. Pettijohn Company, *Knoxville* • H. E. Ransford Co., *Pittsburgh* • Redmond Supply Co., *Phoenix* • J. F. Schaefer & Co., *Kansas City* • R. J. Sullivan & Company, *Boston* • Walter E. Thompson, *Birmingham* • E. E. Torkell, *Memphis* • Triangle Electric Supply Company, *El Paso* • United Electric Supply Co., *Salt Lake City* • Joe Williams, *Little Rock* • *Representatives in other principal cities*

FOR CABLE YOU CAN INSTALL WITH CONFIDENCE



Multi Conductor RoZone-RoPrene® Power Cable—5000 Volts

RoZone-RoPrene Station Control Cable—600 Volts

Single Conductor RoZone-RoPrene Power Cable—8000 Volts Ungrounded Neutral

RoZone-RoPrene Series Street Lighting Cable—2001 to 8000 Volts

SPECIFY RoZone*

The Superior Ozone Resistant Insulation

In high voltage applications where long service life under severe conditions is imperative, Rome RoZone insulation is outstanding. A high quality oil-base compound, its resistance to corona and ozone cutting is exceptional. This, combined with unexcelled resistance to moisture, as well as aging, heat and sunlight, makes Rome RoZone insulated cable completely trouble-free . . . a cable you can install with complete confidence.

Rome RoZone is the result of years of successful operating experience, modern chemical knowledge, materials and up-to-date facilities. Its remarkable stability in water recommends it as the insulation for cables to be buried direct in earth, in wet locations, even for d-c operation where electro-osmosis presents a difficult problem. High dielectric and impulse strength, excellent aging characteristics, plus immunity to corona and ozone cutting especially qualify Rome RoZone as a superior high voltage insulation.

The dependability and high quality of Rome RoZone have made it *first choice* for many applications.

Rome RoZone is the Ideal Insulation for:

High Voltage Power Cables
Series Street Lighting Cables
Station Control and Signal Cables
General Purpose Wiring Where Dependable Quality is Paramount

It Costs Less To Buy the Best

*T. M. Reg.

Unretouched photo of RoZone specimen after long-time ozone test

Unretouched photo of conventional rubber specimen after short-time ozone test

Check These Rome RoZone Premium Quality Features:

- High Dielectric and Impulse Strength
- Excellent Resistance to Corona and Ozone Cutting
- Remarkable Electrical Stability in Water
- Inherent Resistance to Heat, Aging and Sunlight

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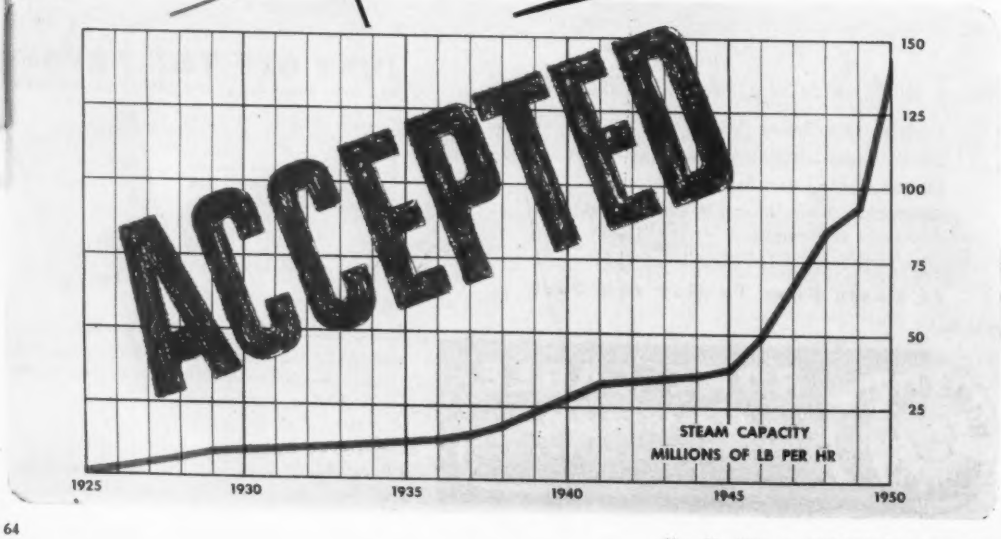
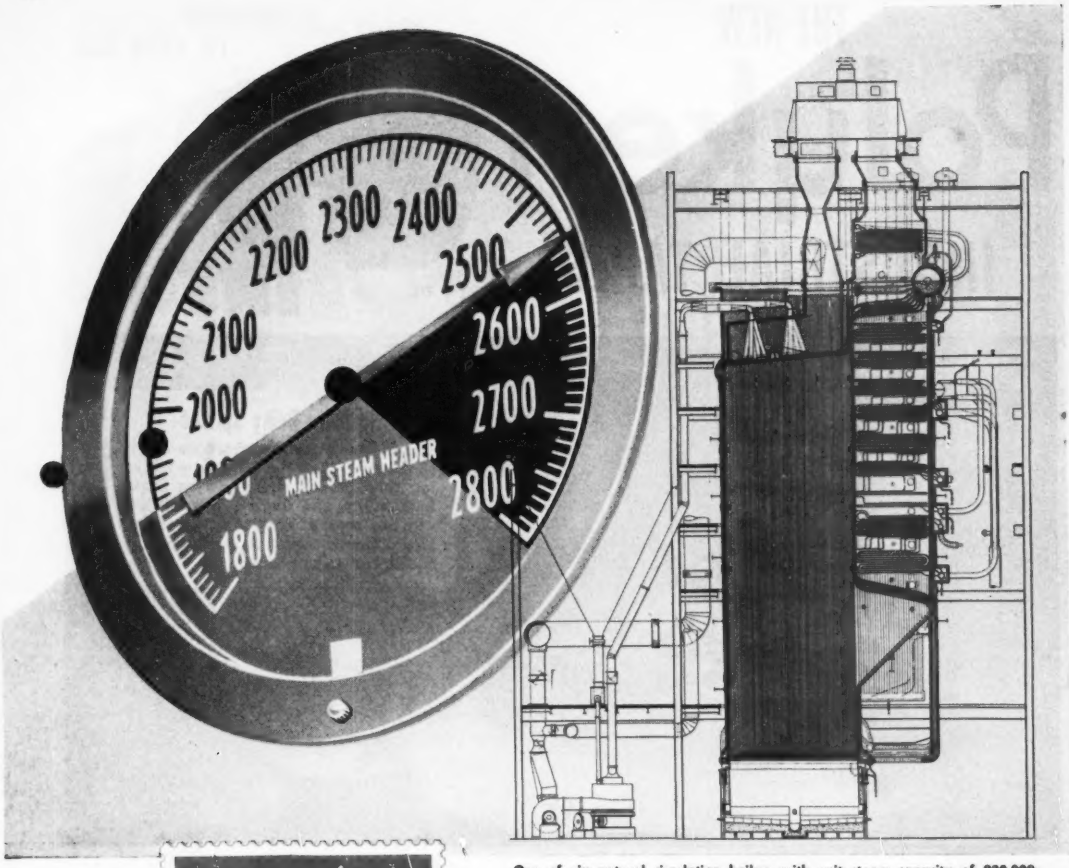
B&W Boilers of 1400-2500 psi serve 15 million kilowatts of generating capacity for 71 power companies





Another Example of B&W Engineering for Economy

One of six natural circulation boilers with unit steam capacity of 930,000 lb. per hr. Boiler design pressure is 2300 psi; throttle pressure, 2000 psi, with final steam temperature of 1050F—reheat to 1000F.

Since 1926, when boiler design pressures first entered the 1400-2500 psi range, B&W has been identified with this presently popular trend toward greater steam-cycle efficiency. This accumulative 25-year experience with natural circulation at the higher operating pressures helps explain why, as the chart shows, B&W high-pressure boilers were preferred for new generating capacity of approximately six million kw during 1950 alone . . . why so many power companies consult B&W first on high-pressure steam requirements with all fuels and firing methods.

Helping America's electric companies to keep power costs down is an 83-year tradition with B&W . . . currently evident in such developments as Cyclone-firing, Pressurized Furnaces, and Gas Recirculation. You'll want to learn the details of these significant features as they relate to your own company's future requirements. The Babcock & Wilcox Company, 85 Liberty Street, New York 6, N. Y.

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Polyken®

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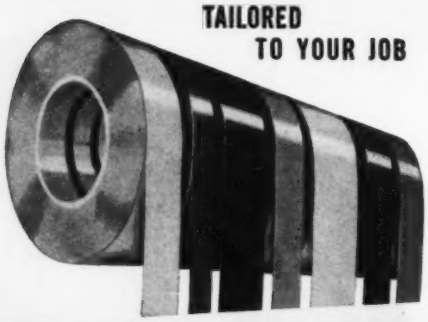

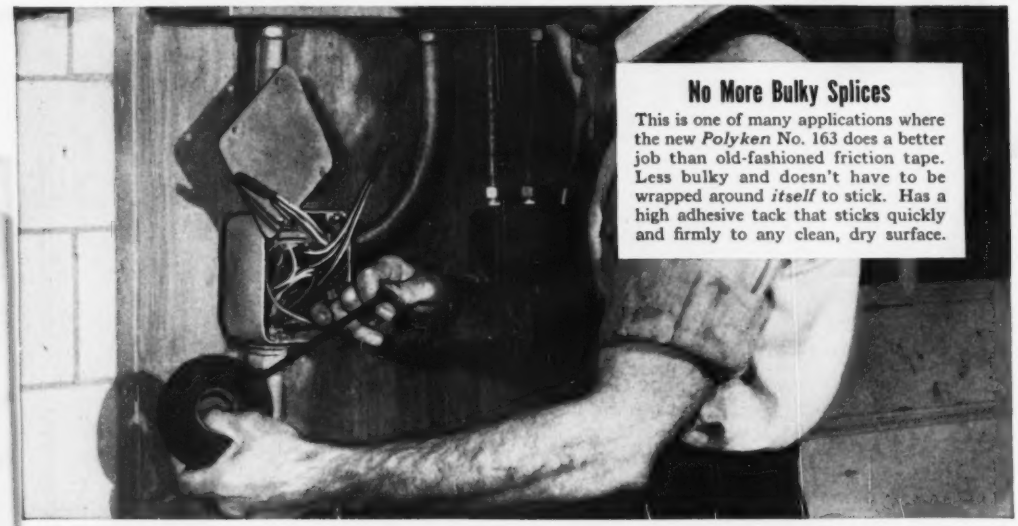

No More Bulky Splices

This is one of many applications where the new *Polyken* No. 163 does a better job than old-fashioned friction tape. Less bulky and doesn't have to be wrapped around *itself* to stick. Has a high adhesive tack that sticks quickly and firmly to any clean, dry surface.

After 70 years—an electrical tape that costs less than friction tape

This is the first new thing that's happened in the friction tape field in nearly a century—*Polyken* No. 163. An electrical tape that sticks to any surface as well as to itself. It has higher dielectric strength with less bulk. Forms a better moisture barrier. Doesn't fray. Sticks better and is easier and cleaner to handle.

All this, new *Polyken* No. 163 brings you . . . yet costs less than old-fashioned friction tape! See your Polyken distributor today.

FREE BOOKLET

To learn more about revolutionary new tape, *Polyken* No. 163, write for free folder, "Test It Yourself!" Address *Polyken*, Dept. EW-E, 222 W. Adams St., Chicago 6, Ill. Or call your distributor.

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Westinghouse

USEFUL LIFE OF WEMCO C TRANSFORMER OIL INCREASED THREE TIMES

Inhibitor Added

Greater freedom from oil maintenance problems! Development of a new inhibiting agent, and its addition to WEMCO C Transformer Oil, has resulted in greatly increased service life.

All the advantages of standard WEMCO C are maintained: low viscosity . . . freedom from acids, alkali, and corrosive sulphur . . . resistance to emulsification . . . freedom from sludging for long (now even longer) periods of service. *Inhibited WEMCO C* now maintains all these properties *three times longer!*

Now supplied as standard in all Westinghouse Distribution Transformers (both "CSP"® and conventional), *Inhibited WEMCO C* will shortly be standard in Westinghouse Power Transformers and will also be available for replacement use. For further information, contact your Westinghouse representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

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PROOF OF BROWN BOVERI

SAVED 1/3 IN COST— DELIVERED ON SCHEDULE!

Unloading the first Brown Boveri Turbine Unit for the City of Cleveland's Municipal Power Plant at a pier in Brooklyn, N. Y. DELIVERY ON SCHEDULE!

When competitive bidding reveals a 1/3 saving on the cost of two 25000/32500-kw Turbo-Generator sets — a saving of enough to purchase a third unit if so desired — that's an outstanding accomplishment! The City of Cleveland realized this tremendous saving when it purchased two Turbo-Generator units for its Municipal Power Plant from Brown Boveri.

A definite delivery schedule was established when the contract was awarded. Brown Boveri delivered on time because it has the vast manufacturing facilities to produce the equipment as needed . . . because it is unhampered by Government regulations and allocations.

When you specify Brown Boveri equipment, you assure yourself of TOP QUALITY at LOW COST, and DELIVERY as promised!

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WORLD ENGINEERING AND MANUFACTURING LEADERSHIP IN ELECTRICAL AND MECHANICAL POWER EQUIPMENT FOR OVER 50 YEARS

230 kV Brown Boveri Air Blast Breaker on test at the Grand Coulee Dam powerhouse.

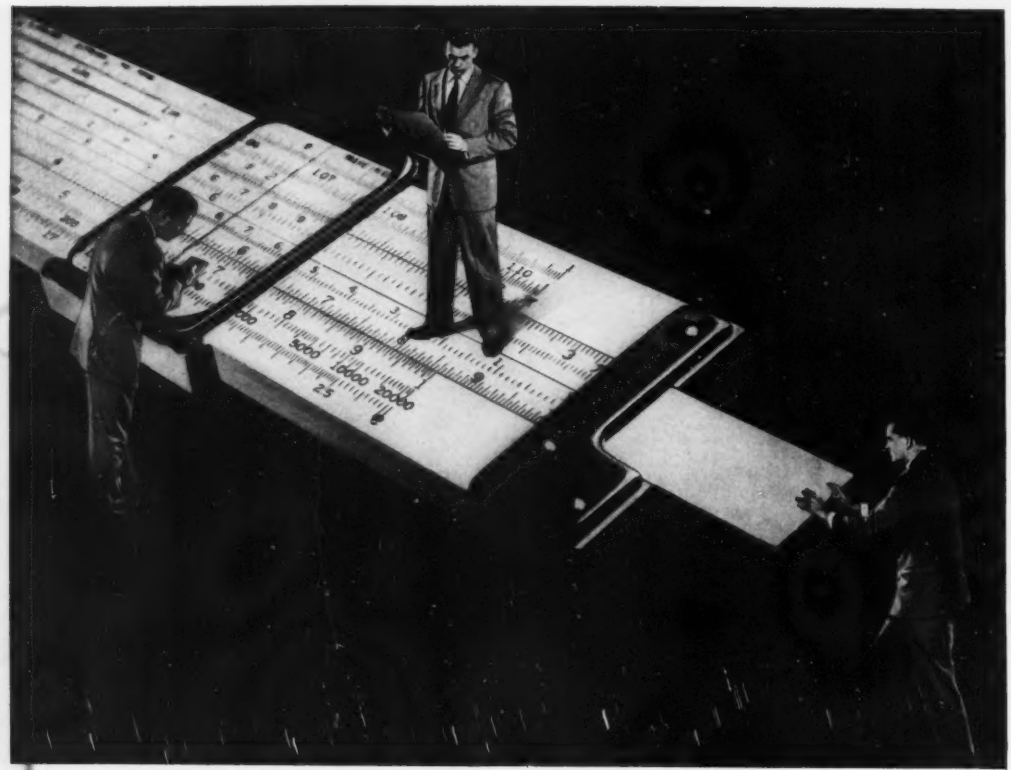
Interrupting 11-million kVA — a value never before approached by air blast breakers — was achieved in tests in the U. S. Bureau of Reclamation system by a Brown Boveri Air Blast Circuit Breaker.

The final tests, made on March 18th at the Grand Coulee Dam powerhouse, proved that this Brown Boveri Air Blast Breaker is capable of interrupting in 2½ cycles faults up to 11-million kVA, 3-phase equivalent. Other tests proved that this breaker could interrupt, without restrike, charging currents for lines up to 300 miles long! That's history in the making!

Such performance is made possible by Brown Boveri leadership in research and manufacturing techniques. This same leadership has made all Brown Boveri equipment famous the world over.

19 RECTOR STREET, NEW YORK 6, N. Y.

some problems demand special attention



Most day to day problems your company faces can be solved within your own organization.

Yet many utility companies have found that in handling specialized problems involving industrial relations, systems and methods, insurance and pensions, sales and public relations, or new construction, it is often more efficient and economical to engage outside help.

EBASCO business consultants, engineers and constructors are available to help you as needed on any such problem. During the past half century, this team of specialists has accumulated a vast background of experience in working with public utilities both in this country and abroad.

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You said it... ...We did it!

We designed ELEMEX capacitors to give you what you need!

Utility men with ten to fifteen years of field experience knew pretty well what they needed and wanted in capacitors. Just about ten years ago L-M began its capacitor design and in 1944 began producing capacitors incorporating some of these user-ideas.

ELEMEX capacitors have an excellent service record. Rate of failure has been low; performance has been consistently good—so good, in fact, that we have never completely caught up with the demand for more and more ELEMEX capacitors.

Here are some of the things you said you wanted in a capacitor, and what L-M has done about it.

1. **Long life:** L-M's low unit insulation stress, individual evacuation, capillary impregnation and many in-process tests have assured a very long life and freedom from trouble. We're proud of our performance record! Over 99.44% of all ELEMEX capacitors manufactured over a 7-year period are still in operation. That is a failure rate of less than 1/10% per year!

2. **Strong solder-sealed bushings:** L-M developed a new, stronger method of solder-sealing. L-M tests 100% of its bushings and seals. Actually, it takes 1900 pounds to force an L-M bushing out of the cover! Also we've got higher creepage distance, unbreakable terminal caps.

3. **Pure aluminum electrodes:** Not just tinned copper—but pure aluminum.

4. **Simple, easy installation:** We designed them with uniform terminal height above mounting flanges, gave you "Paragroove" connectors which simplify wiring.

5. **Low-cost maintenance:** L-M introduced stainless steel tanks and will *continue* to produce them as long as Type 304 is available. (Incidentally, this forced down the price of mild steel units, which saved you money on *both* types!) L-M mild steel tanks have *three* coats of enamel, each *baked* separately, not just one or two spray coats.

6. **Streamlined tanks:** Large-radius rounded corners make ELEMEX tanks smooth, give improved appearance, and extend paint life. Sharply sheared edges always corrode first.

7. **Convenient, sensible packaging:** In sturdy, wood reinforced sealed cartons. Full identification printed on sides and ends of carton, with the serial number repeated on the top of the carton for the convenience of the storekeeper. Painted surfaces subject to abrasion in shipment are protected with wax paper. Only L-M packs its 2 and 4 unit hangers in individual cartons to simplify handling for you.

8. **Simple low-cost switching:** L-M's new Voltage-Sensitive Control gives you accurate, dependable switching at a cost low enough to permit its use even with small capacitor banks.

Want to cut line losses? Reduce wattless current on your lines? Get capacitors that stay on the job? Ask the L-M Field Engineer for full information on ELEMEX capacitors; or write Line Material Company, Milwaukee 1, Wis. (a McGraw Electric Company Division).

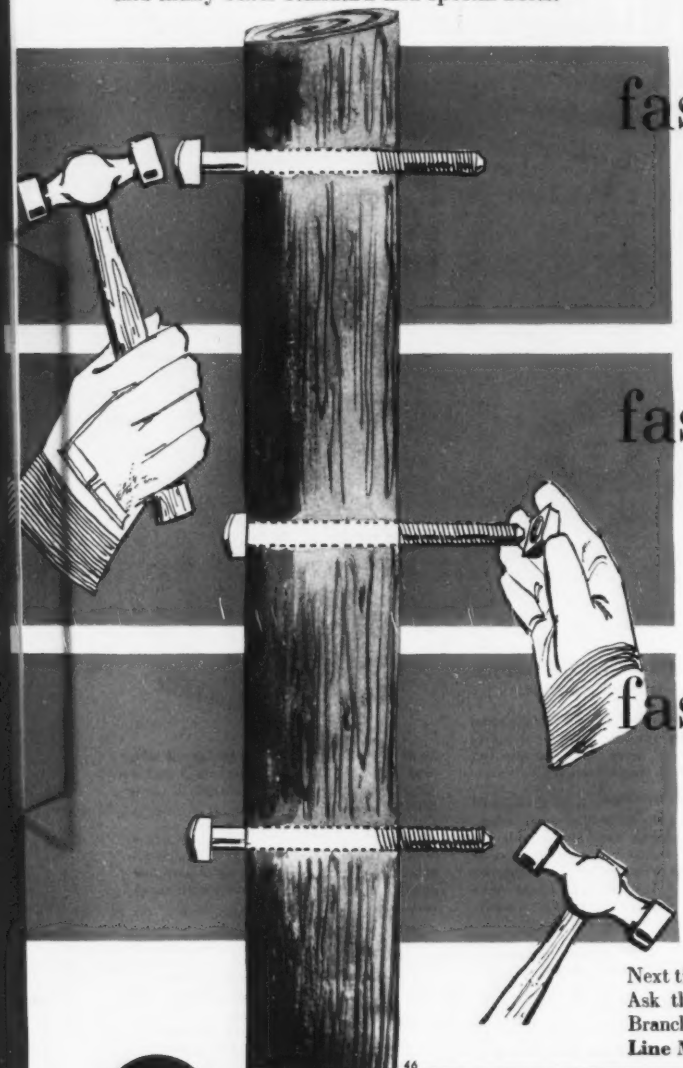
LINE MATERIAL... Capacitors

Complete Coordinated Equipment for Distribution Today

You can speed up construction with

L-M Buffer Point Bolts

Buffer Points are standard on all L-M Bolts 6" and longer, including carriage bolts, machine bolts and double arming machine bolts, eye, double arming, and thimble eye bolts and many other standard and special bolts.



faster driving

tapered buffer point guides the bolt through the hole, with less friction

faster threading

buffer point guides the nut right onto the thread—no fumbling, no lost time

faster salvaging

hammering the point removes the bolt quickly—can't hurt the thread

Next time you order bolts, get L-M Buffer Point Bolts. Ask the L-M Field Engineer, call the nearest L-M Branch, or write, wire, or phone **Hardware Division, Line Material Company, Milwaukee 1, Wisconsin.**

46

LINE MATERIAL Pole Line Hardware

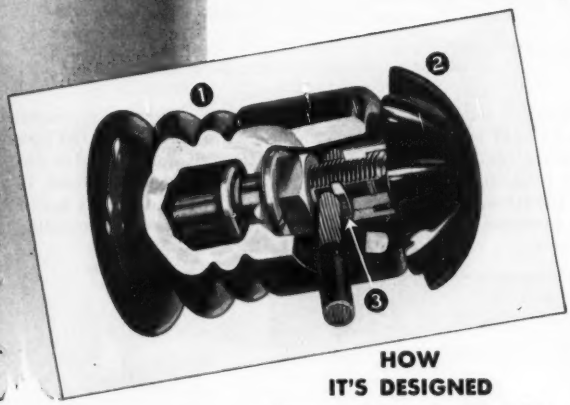
Complete Coordinated Equipment for All Distribution Requirements

HERE'S L-M's OUTSTANDING

new sidewall bushing

FOR DISTRIBUTION TRANSFORMERS

← *better*
← *faster*
← *safer*



HOW IT'S DESIGNED

Heavy machined wet-process porcelain (1) with ample leakage distance. Extra strong finger-grip handle (2) will not come off accidentally, but can be removed for inspection. Heavy connector (3) machined of solid metal; conductor hole opens on one side of bushing only —conductor cannot go through to cause accidental contact; connector and hole will accommodate up to two full-size conductors. Leak-proof design inherently siphon-proof.

here's why L-M's new sidewall bushing is *better*—better for the transformer and the user because it permits lower, lighter transformers requiring less pole space . . . better because it makes a firmer, more permanent connection . . . better because of its extra strong, heavy design.

IT'S FASTER, because the lineman can make transformer connections more quickly. He inserts the bared end of the conductor into the hole in the bushing, and spins the finger-grip knob tight. That puts a permanent, firm squeeze around the complete circumference of the conductor, assuring a good electrical connection that cannot pull out. Connector will take full range of EEI-NEMA-prescribed conductor sizes.

IT'S SAFER, because there are no exposed live parts, no sharp edges or projections to catch gloves or snag clothing. This new bushing is now standard on all L-M transformers up to 5000 volts. For complete information on L-M transformers and the new bushing, ask the L-M Field Engineer, or write Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

LINE MATERIAL—*Transformers*

Complete Coordinated Equipment for Distribution Today

Another Example of L-M Leadership

L-M's ORTO

(*oxidation-resistant transformer oil*)

gives you all these advantages:

- longer life for the transformer, with the same overload capacity, or . . .
- higher overload capacity with the same transformer life
- reduced oil acidity and sludging
- maintained high impulse strength

and

- ORTO mixes with any other oil, conventional or inhibited
- ORTO will not react with other inhibitors
- ORTO is available as a *concentrate* for adding to your present oil stocks, for adding to power transformer oils, and for prolonging the life of reclaimed oil

Since its announcement, which led the industry, ORTO® has been a phenomenal success. Naturally L-M and L-M research engineers are gratified by ORTO's acceptance and this acceptance was deserved, by the long, rigorous careful checking into oils and inhibitors. New accelerated test methods were developed, to make sure that ORTO was as good as expected. ORTO was thoroughly tested and proved by extensive investigation and accelerated life tests representing many years of service.

Comparative curves show the deterioration of transformer oil in service. A high-grade conventional oil deteriorates at a gradually accelerating rate. Over-refined oils may have a better response to the inhibitor; but once the inhibitor has been used up, the oil has little resistance to oxidation, and deteriorates rapidly. ORTO brand oil is a high-grade conventional oil with an inhibitor which greatly extends the beginning of the deterioration, which, when it finally starts, assumes the same gradual curve as with any high-grade conventional oil.

Ask the L-M Field Engineer for information on ORTO; or write Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

LINE MATERIAL . . . Transformers

Complete Coordinated Equipment for Distribution Today.

Quiet as a kitten

ELIMINATE NOISE AND RADIO TROUBLES ON 24.9 GR.Y/14.4 KV SYSTEMS WITH THIS L-M ROUND-WOUND TRANSFORMER

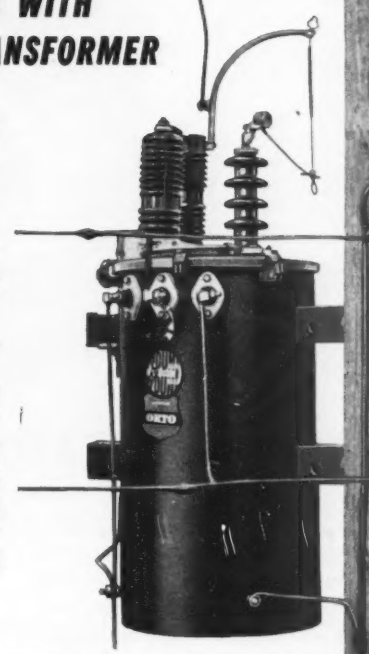
Loose cores and leaky bushings can make lots of trouble on 24.9 Gr.Y systems. Some cores get loose and hum annoyingly. The radio noise from a poorly designed bushing can drown out a distant broadcasting station—which doesn't make the neighbors happy.

L-M has built a Round-Wound® transformer especially for this service—with a core that's quiet as a whisper—it is wound from continuous strip steel, and not cut; it stays quiet!

Oil-filled bushings are specially designed and processed—they give NO radio interference.

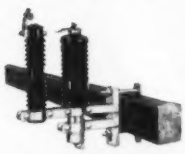
Like all Round-Wound transformers, this one has a high impulse level and high overload capacity.

The transformer and coordinated equipment have all been thoroughly tested in actual use in a number of locations throughout the country; they offer long life and dependable, economical service. Ask the L-M Field Engineer who calls on you for all the details; or write Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).



24.9 Gr.Y/14.4 kv Transformer "I believe L-M is the only outfit that knows how to build this class of equipment," says one user. Here's the transformer he was using—the self-protected 24.9 Gr.Y/14.4 kv to 120/240 volts. Available in protected or conventional types, 3 to 25 kva single phase; four taps at 13.8, 13.2, 12.87, and 12.54 kv.

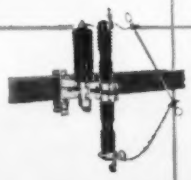
COMPLETE COORDINATED EQUIPMENT FOR 24.9 GR.Y/14.4 KV SYSTEMS



Heavy Duty Expulsion Arrester Type PF-3, 18 kv with 65,000 amp surge capacity, gives dependable protection to transformer and system.

New 24.9 Gr.Y/14.4 kv Cutout Swivel type hanger; double entrance contacts permit fusing from either side. Silver-plated solid phosnic bronze spring and contact assembly—no steel core to nick and rust!

New KYLE 25 kv Recloser The sensational new type E, designed especially for 25 kv service, with heavy construction, cross-blast arc extinguishing, wide choice of operating curves and sequences. Extremely accurate to permit close coordination with fuses or other reclosers. ORTO-filled for longer life.



Combination Arrester and Cutout Choice of swivel hanger for crossarm mounting, shown here; or for transformer mounting (shown on transformer above), top can be rotated to assure vertical fuse mounting on any size or make transformer regardless of tank diameter.

LM®

LINE MATERIAL —Transformers

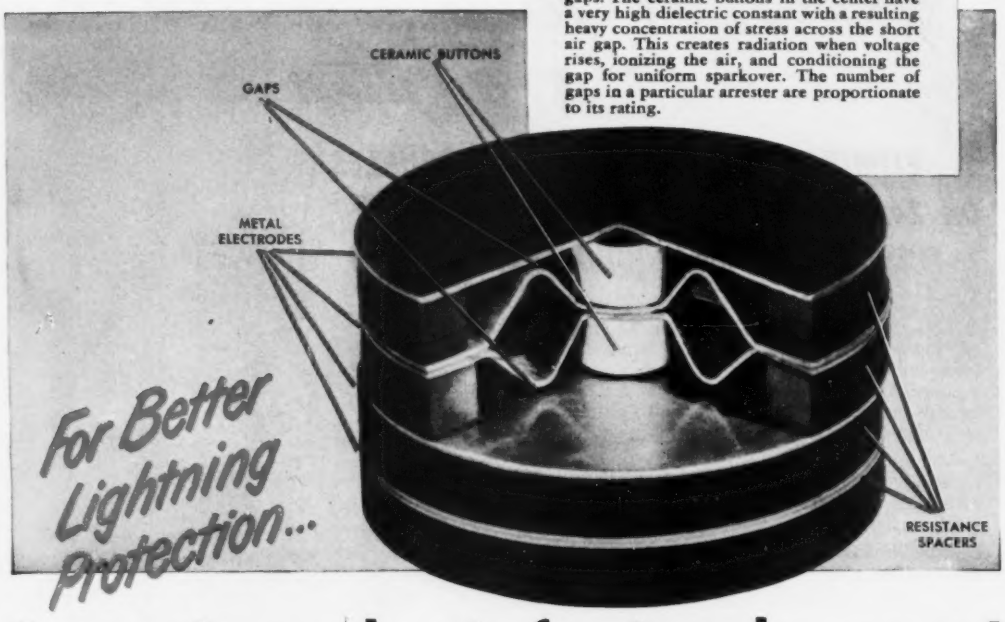
Complete Coordinated Equipment for Distribution Today

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

HERE'S HOW IT WORKS

View shows two sections of the "pre-ionized gap" with one cut away to show gap arrangement. The high resistance spacers allow for a constant flow of a small leakage current, which equally divides the voltage across the series of gaps. The ceramic buttons in the center have a very high dielectric constant with a resulting heavy concentration of stress across the short air gap. This creates radiation when voltage rises, ionizing the air, and conditioning the gap for uniform sparkover. The number of gaps in a particular arrester are proportionate to its rating.



An engineered exit for impulse amps!

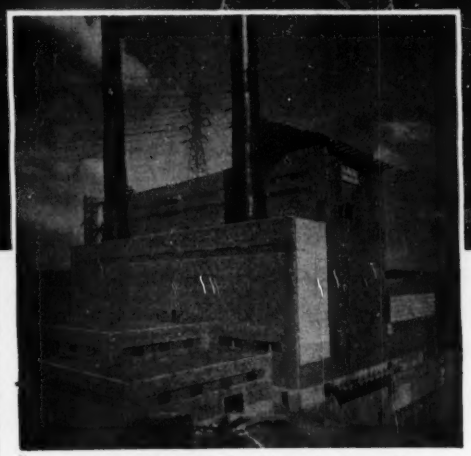
We call it the "pre-ionized gap"... this hidden feature that assures *low and consistent sparkover* in Westinghouse Valve-type Arresters. It's exclusively Westinghouse and it offers a *sure* way to provide *complete* protection for your valuable system equipment.

In Westinghouse SV and LVS Arresters the gaps are arranged for low sparkover on impulse and high sparkover on 60-cycle voltage. The gaps are enclosed in a porcelain tube with metal caps solder-sealed on each end. Seals are pressure-tested to make sure no moisture will enter in service; and before final sealing, the assembly is purged with dried air to exclude initial moisture. There is never need for internal maintenance.

For complete information on LVS (20 to 73 kv) and SV (3 to 242 kv) Arresters, ask for bulletins DB 38-120 and DB 38-130, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-60724

A new "high" in tower dependability and economy



American Bridge Company fabricated and erected the structural steelwork for the new Philip Sporn Plant, which utilizes four of the largest steam generators in the country.

These 240-ft. river crossing towers are among the highest in use. They're double circuit, 132 kv towers carrying six 477,000 CM, ACSR conductors and one 159,000 CM, ACSR ground wire.

"Streamlined" towers handle heavy duty job for A. G. E. System

THE tall, double-circuit towers shown above are among the approximately 160 erected to join the new 550,000-kw Philip Sporn Plant at Graham Station, W. Va., to the 132 kv transmission network of the American Gas and Electric System.

Designed and fabricated by American Bridge Company, these steel towers stand as proof of the soundness of "streamlined" towers—stripped of all non-essentials—for even the heaviest duty. Equipped with steel grillage earth anchors, they offer the added economies of simplified installation and frill-free construction that resists wind and wintry weather.

American Bridge has been designing, fabricating and erecting transmission towers for the nation's leading power companies for forty-five years. Its experience and facilities are second to none. Why not submit any questions you might have to our nearest Contracting Office? An inquiry involves no obligation.

AMERICAN BRIDGE COMPANY

General Offices: Frick Building, Pittsburgh, Pa.

Contracting Offices in: AMBRIDGE · BALTIMORE · BOSTON · CHICAGO · CINCINNATI
CLEVELAND · DENVER · DETROIT · DULUTH · ELMIRA · GARY
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PORTLAND, ORE. · ST. LOUIS · SAN FRANCISCO · TRENTON
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

AMERICAN BRIDGE

UNITED STATES STEEL

The CONDULET* and rigid

MECHANICAL PROTECTION

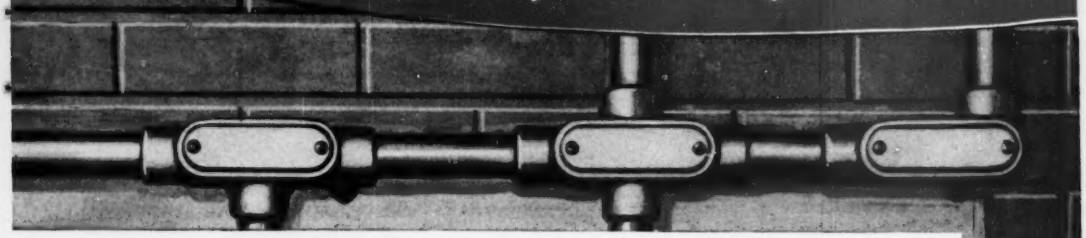
Crouse-Hinds sturdy cast Feraloy CONDULETS and rigid conduit provide the best possible protection against accidental damage to electrical wiring and equipment ... prevent costly shutdowns.

*CONDULET is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

A Nationwide Distribution Through Electrical Wholesalers

CONDULETS • TRAFFIC SIGNALS

conduit method gives you
MAXIMUM PROTECTION
to wiring and equipment



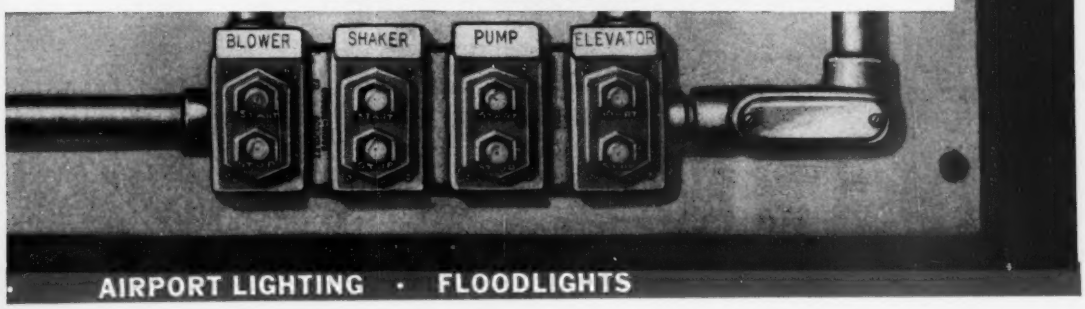
Other definite advantages

- **ECONOMY.** The installed cost of Crouse-Hinds CONDULETS and rigid conduit compares favorably with other wiring methods. The added advantages make it the really economical method that pays dividends over the years.
- **SAFETY.** Ground continuity is of vital importance. CONDULETS with taper threaded hubs and rigid conduit with tapered threads make a secure joint that provides a reliable and permanent low resistance path to ground. This safety feature assures maximum protection against personal injury and fire.
- **CORROSION RESISTING.** Cast Feraloy CONDULETS give the best protection wherever moisture, dust, or corrosive atmospheres are present.
- **FLEXIBILITY.** A modern CONDULET installation provides for growth and changing conditions. CONDULETS with detachable hub plates can be used to make it easy to change circuits or add new ones.
- **UNIVERSAL APPLICATION.** You can install galvanized CONDULETS and galvanized rigid conduit under all atmospheric conditions and in all occupancies.
- **SECURE ATTACHMENT** of devices. The mounting holes in CONDULETS are drilled and tapped in the cast metal body . . . no weak mounting ears to twist off.
- **QUALITY.** The trademark CONDULET stands for the highest quality, reliability, and long life.
- **VARIETY.** More than 15,000 items are listed in the CONDULET Catalog, including a complete explosion-proof and dust-tight line for use in hazardous locations.

On YOUR next electrical layout, plan to get all the benefits of sturdy cast Feraloy CONDULETS and rigid conduit . . . the universal wiring method.

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

Offices: Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas — Denver — Detroit — Houston — Indianapolis — Kansas City
Los Angeles — Milwaukee — Minneapolis — New York — Philadelphia — Pittsburgh — Portland, Ore. — San Francisco — Seattle
St. Louis — Washington. *Resident Representatives:* Albany — Atlanta — Baltimore — Charlotte — New Orleans — Richmond, Va.
CROUSE-HINDS COMPANY OF CANADA, LTD., TORONTO, ONT.



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SWITCHBOARD INSTRUMENTS
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The most complete line in the industry!

In the complete line of Westinghouse Electrical Instruments, you're sure to find the *right answer* to your measuring requirements. Moreover, you'll get a wider selection for specific applications, whether it be a-c or d-c current and voltage, single or polyphase circuits, watts or vars, frequency, power factor, synchroscopes, temperature indicators, ground detectors or position indicators.

For laboratories, production lines, power plants, field service, or military operations—whether the requirement is for recording or indicating—for portable or permanent application—Westinghouse Instruments give you lasting accuracy.

Meets A.S.A. Performance Requirements

Every Westinghouse Instrument is built to meet the rigid performance requirements of the American Standards Association. No more exacting guarantee of an instrument can be made.

Competent Application Assistance!

Westinghouse Instrument Application Engineers are available to help you in selecting and applying the proper instruments for your application. Simply call your nearest Westinghouse office.

For complete information on Westinghouse Instruments write for Booklet B-4696. Address: Westinghouse Electric Corporation, P. O. Box No. 868, Pittsburgh 30, Pennsylvania. J-40406

YOU CAN BE SURE... IF IT'S
Westinghouse
INSTRUMENTS

UTILIZE THE DEPENDABILITY OF *ElectroniK* POTENTIOMETERS

CHECK THE FEATURES OF *ELECTRONIK* POTENTIOMETERS THAT MEAN MOST TO YOU . . .

- SIMPLICITY
- ACCURACY
- DEPENDABILITY
- RUGGEDNESS
- FLEXIBILITY

THE dependability you demand from your recording instruments, the months on end of satisfactory service, the continuity of operation that supports peak efficiency . . . all are insured by the *ElectroniK* Potentiometer and by the dependability of its primary and vital components.

As with other Brown instruments, the components of the *ElectroniK* Potentiometer are lifetested, service proven, and designed for minimum and easy maintenance. It takes little more than a glance to appreciate the dependability of its positive balancing motor, its hermetically-sealed converter, its simplified continuous balance amplifier, as well as its minimum of moving parts and the obvious freedom of adverse effect from dust and atmospheric moisture.

Add to this a simplicity of design, higher accuracy, greater ruggedness and greater flexibility of application . . . and you get a true picture of how the *ElectroniK* Potentiometer—Precision Indicator, Circular or Strip Chart Recorder—is able to add to your plant efficiency.

For further information, call your nearest Honeywell engineer or write for Data Sheets 10.20-1, 10.20-2 and for Catalog 15-15.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4568 Wayne Ave., Philadelphia 44, Pa. Offices in more than 80 principal cities of the United States, Canada and throughout the world.

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

Nordin & Peabody

THERE'S ONLY ONE WAY TO GET COMPLETE LIGHTING SATISFACTION

Only one way — QUALITY EQUIPMENT. It is the economical way, too. That is why it is best to specify Miller lighting equipment. It is built on an 8-Point standard of quality construction, with engineering features that minimize cost of installation and maintenance.

Thousands of installations, in stores, offices, schools, factories and public buildings, have proven the enduring QUALITY of Miller lighting equipment, and its LOW OVERALL COST — cost of equipment, installation and maintenance — the important point to be considered in planning lighting.

For complete lighting satisfaction, SPECIFY MILLER — one source of supply for QUALITY equipment for the best use of Fluorescent, Incandescent, and Mercury-vapor lighting. Developed on a background for 107 years pioneering and progress in Good Lighting. Miller field engineers and distributors are conveniently located for nation-wide service.

THE miller COMPANY MERIDEN, CONN.
SINCE 1844

ILLUMINATING DIVISION: Fluorescent, Incandescent, Mercury Lighting Equipment
HEATING PRODUCTS DIVISION: Domestic Oil Burners and Liquid Fuel Devices
ROLLING MILL DIVISION: Phosphor Bronze and Brass in Sheets, Strips and Rolls

Allis-Chalmers Experience Planning Industrial Distribution Systems!

CALLED IN EARLY on a food processor's expansion and modernization program, Allis-Chalmers engineers found that tremendously increased capacity was necessary. But additions to their 480 volt system were out of the question because short circuit capacity already exceeded the interrupting capacity of commercially available breakers. Economy and safety demanded a new distribution system.

On the basis of extensive experience with conversion problems of this type, Allis-Chalmers engineers made the following recommendations:

1. *Install a 12,000 volt primary distribution system to load centers.* This would reduce line losses; eliminate long, heavy copper bus runs, and improve voltage regulation.

2. *Use Dry-Type Load Center Unit Substations with primary selector switches.* This would permit feeding existing and new machinery from either a preferred or an emergency source, shorten low voltage runs, and give adequate short circuit protection from commercially available breakers of economical size.

This solution was so satisfactory that it has since been applied at two branch plants. This year alone 17 substations have been added to 37 previously installed in their plants . . . attesting not only to satisfaction with the system—but to satisfaction with Allis-Chalmers engineering service and equipment as well!

Call in A-C at the Basic Planning Stage

What Allis-Chalmers Unit Substation engineering is doing for others, it can do for you! And the time to call on this experience is during basic planning, early enough for sound equipment recommendations. An A-C representative is ready to go to work with you at your convenience. Get in touch with him at your nearby Sales Office, or write direct.

A-2939

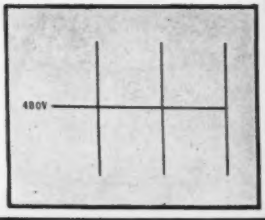
ALLIS-CHALMERS, 932A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-

Pioneers in Load Ratio

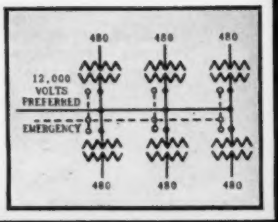
BEFORE

Before modernization the entire plant was on a single low voltage system. This meant excessive line losses, poor voltage regulation, and long runs of heavy copper to carry the required kva. The system was inadequate.



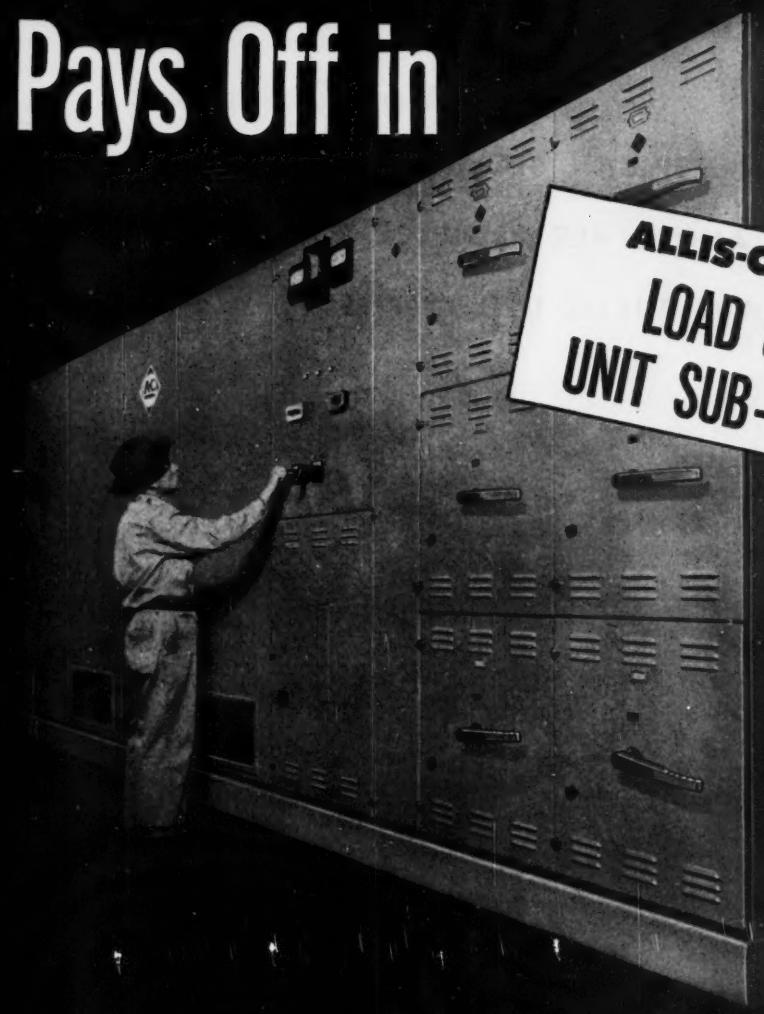
AFTER

Aftermodernizationa12,000 volt primary distribution system carried the required kva through lighter copper, cut line losses, improved voltage regulation, and had the added dependability of an emergency source.



Pays Off in

Number 3
In a Series
Solving Industrial Power
Distribution Problems.



ALLIS-CHALMERS
LOAD CENTER UNIT SUB-STATIONS

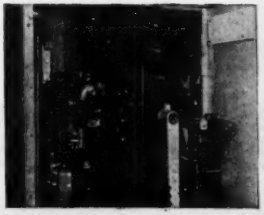
CHALMERS

A-C ALLIS-CHALMERS

Control — Originators of 5/8% Step Regulation

SAFETY & ECONOMY

Safety and economy resulted from the new set-up. Now economical 50,000 AIC feeder breakers provide adequate protection, a job no commercially available breaker could do on the original system. Results: safety, dependability and easier maintenance.



SEND FOR LITERATURE

Helpful Planning Literature: Bulletins: 11B6285A, "How Power at Load Centers Pays Off!"; 11B6325B, "Check List to Simplify Unit Substation Planning"; 11B6895, "Planning and Engineering Guide book for LCS Unit Substations."

IT HAS BEEN AMERICAN BLOWER'S PRIVILEGE TO SERVE THESE AND OTHER PRODUCERS OF POWER IN THE PUBLIC UTILITY FIELD

Buffalo Niagara Electric Corporation
Central Arizona Power & Light Company
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Consolidated Gas, Electric Light & Power Co. of Baltimore
Connecticut Power Company
Dairyland Power Co-operative
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Eastern Shores Public Service Company
Fitchburg Gas & Electric Light Company
Florida Power Corporation
Florida Power & Light Company
Gulf Power Company
Hartford Electric Light Company
Indianapolis Power & Light Company
Iowa Public Service Company
Iowa-Illinois Gas & Electric Company
Iowa Power & Light Company
Iowa Electric Light & Power Company
Kansas City Power & Light Company
Kansas Power & Light Company, The
Kansas Gas & Electric Company
Long Island Lighting Company
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Louisiana Power & Light Company
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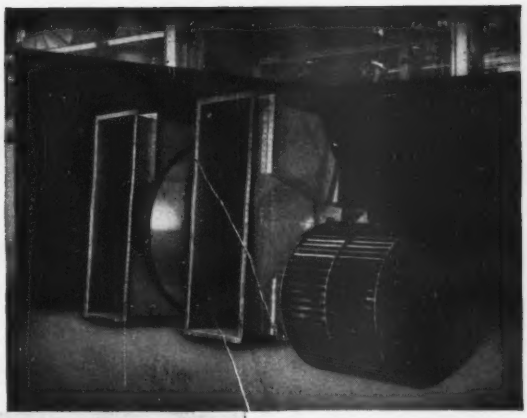
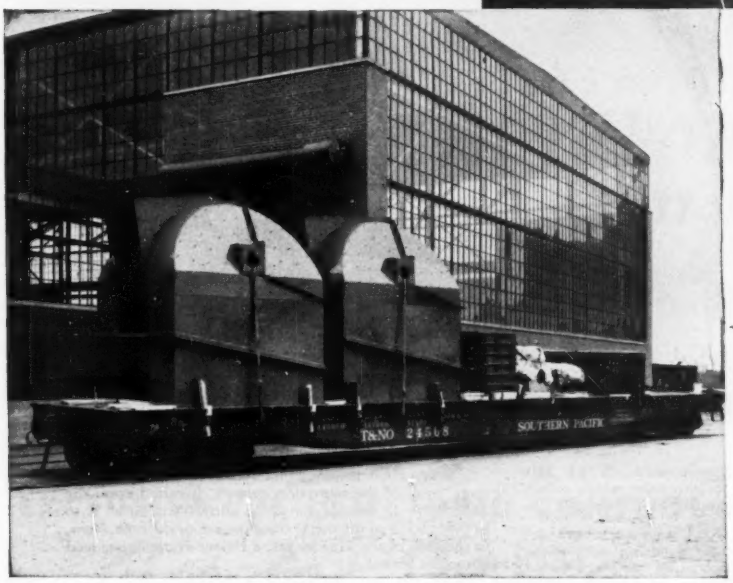
Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

Mechanical Draft Fans
for
Potomac Electric Power Co.
Benning Station, Washington, D.C.

To supply the ever-increasing demand for electric power in the Washington, D.C. area, still another of America's great public utilities, Potomac Electric Power Co., is expanding and enlarging its facilities and services.





Above is shown one of 2 American Blower Forced Draft Fans ready to be loaded on a freight car for shipment to the Potomac Electric Power Co., Benning Station. Each fan will be equipped with louvre controls and outlet dampers. The capacity of each fan is 135,000 CFM at 100° F. at 15.8" SP.

The photograph at the left shows 2 American Blower Induced Draft Fans loaded on a freight car and ready for shipment.

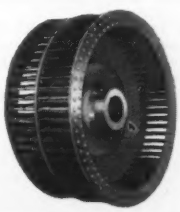
These fans will be equipped with inlet and outlet dampers and each has a capacity of 171,000 CFM at 330° F. at 22.0" SP.

You'll find dependable American Blower Mechanical Draft Fans measure up to the most exacting power plant requirements. High static efficiency, low R.P.M., low tip speed and low inlet velocity are but a few of the many reasons these fans have found such wide acceptance with public utilities.

For complete information, contact your nearest American Blower Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICH.
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary corporation



The Sirocco Wheel

The unique and scientific design of the Sirocco wheel provides a structure of unusual strength, unobstructed, for smooth air flow. The blades are die formed, assuring exact duplicates, and are machine riveted to the backplate and rim, so that each blade is set in the wheel at exactly the correct angle.

YOUR BEST BUY AMERICAN BLOWER POWER PLANT EQUIPMENT

Serving home and industry

AMERICAN-STANDARD · AMERICAN BLOWER · CHURCH SEATS · DETROIT LUBRICATOR · KEWANEE BOILERS · ROSS HEATER · TONAWANDA IRON

Again a D-H ALLOY contributes as RCA introduces new ELECTROSTATIC-FOCUS TV TUBES

Once more, RCA leads the field! This time, with new rectangular picture tubes which require no focusing coil or focusing magnet . . . thus effecting important savings in critical materials.

The currently used magnetic focus in TV sets requires coils and magnets containing the metals cobalt and copper . . . both on the Government's restricted list.

To meet the shortages, RCA engineers have developed improved electrostatic focusing for wide-deflection-angle TV tubes—eliminating need for a focusing magnet or coil. Result: The new RCA kinescopes—which not only make possible savings in critical materials, but introduce advantages that destine them to become industry's most widely used picture tubes.

Such advantages, for example, as: (a) An improved electron gun which provides excellent uniformity of focus over the entire picture area, and is so designed that the focusing electrode takes negligible current—permitting voltage for the electrode to be supplied easily and economically; (b) Focus automatically maintained with variation in line voltage and adjustment of picture brightness; (c) Simplification of tube installation and adjustment for optimum performance.

When RCA produced its outstanding Image Orthicon, "eye" of the television camera, it called upon the superlative Driver-Harris radio alloy Nichrome* V to provide 95% of the metal components of the tube. Now, in the case of the kinescopes, a Driver-Harris produced alloy fills a need.

Here are typical examples of how Driver-Harris stands ready to serve all industry with alloys necessary for new or standard applications.

During the present emergency, of course, strategic materials and the alloys made from them are on strict allocation. However, we shall be glad to make recommendations based upon your specific needs, and serve you to the best of our ability.

Makers of world-famous Nichrome and over 80 other alloys*
for the electronic, electrical and heat-treating fields

Driver-Harris Company

HARRISON, NEW JERSEY

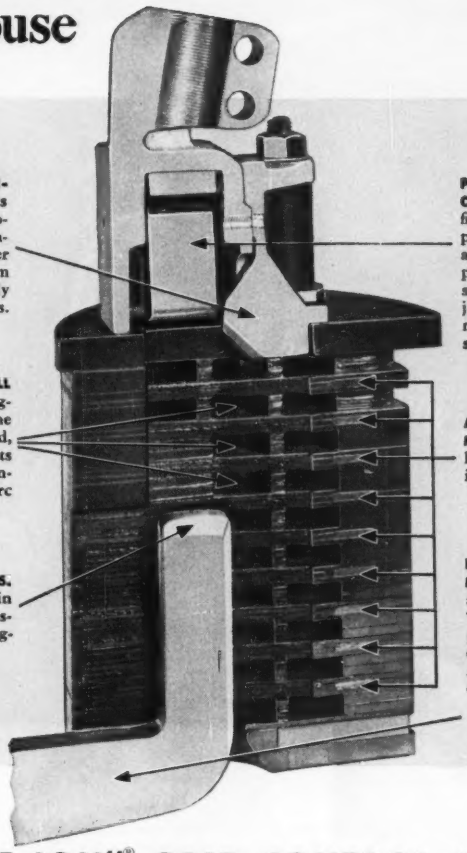
BRANCHES: Chicago, Detroit, Cleveland, Los Angeles, San Francisco

In Canada: The B. GREENING WIRE COMPANY, LTD., Hamilton, Ontario, Canada

*T.M. Reg. U.S. Pat. Off.

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



ARC HORN PROTECTS CONTACTS. Arc horn supplements "De-ion" Grid action to protect contact faces from burning. As contacts open, upper arc terminal transfers from finger to arc horn. Easily removable to inspect contacts.

EFFICIENT INTERRUPTION AT ALL CURRENT VALUES. Arc is magnetically forced back into the closed section of the grid, where oil trapped in pockets provides fresh flow of unionized gas . . . prevents arc from restriking.

ARC-RESISTING CONTACT TIPS. Maximum life of contacts in high-capacity breakers is assured by arc-resisting, tungsten alloy contact tips.

POSITIVE, LOW-RESISTANCE CONTACT. Large contact fingers, backed by heavy compression springs, assure adequate contact and proper pressure over entire contact surface without sensitive adjustments. Contacts easily meet the momentary and four-second ratings.

ARC PATH LENGTHENED BY MAGNETIC CONTROL. Insulated iron plates pull the arc into contact with fresh oil.

LONG CONTACT LIFE CUTS MAINTENANCE. Contact areas are kept free from burning by "De-ion" Grid action. Grids provide rapid control of fault currents by quenching the arc. Arc is drawn into the pockets of grid, cooled and snuffed out.

EXCLUSIVE "DE-ION"® GRID CONTROL ASSURES

Greater Service Continuity

FOR 15 TO 69-KV LINES

Only Westinghouse Outdoor Frame-mounted Oil Circuit Breakers give you "De-ion" Grid Arc Control, which sharply reduces contact burning and oil deterioration. The result . . . *substantially reduced maintenance costs!*

Get the facts about this and other *plus* features of Westinghouse Breakers. Call your nearby Westinghouse representative, or write for booklet B-3686-A. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna. J-60737

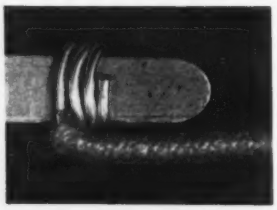
DESIGN TESTED AND VERIFIED IN THE Westinghouse HIGH-POWER LABORATORY

Westinghouse

POWER CIRCUIT BREAKERS

This "gun" shoots wire around corners

Bell Telephone Company craftsman wraps a wire to complete a connection. Wire is inserted into the nozzle and a rotating spindle whips it around terminals.



Close-up of connection made with new tool—neat, tight windings.

IT DOESN'T take long to wrap a wire around a terminal and snip off the end. But *hundreds of millions* of such connections are being made each year to keep up with America's growing demand for telephone service.

Now this job is done much more efficiently with a new wire wrapping tool invented at Bell Telephone Laboratories. This "gun" whirls wire tightly around terminals before solder is applied. The connection is better and there is no excess wire to be clipped off — perhaps to drop among a maze of connections and cause trouble later.

The new tool is being developed in different forms for specialized uses. The hand-operated wrapper in the illustration is for the telephone man's tool kit. Power-driven wrappers developed by Western Electric, manufacturing unit of the Bell System, are speeding the production of telephone equipment. The gun's small nozzle reaches where fingers couldn't — a big advantage these days when efforts are being made to produce telephone system parts smaller as well as better.

Bell Telephone Laboratories scientists devise many special tools that help your telephone system to keep pace with service demands economically — keeping your telephone service one of today's best bargains.

BELL TELEPHONE LABORATORIES

WORKING CONTINUALLY TO KEEP YOUR TELEPHONE SERVICE BIG IN VALUE AND LOW IN COST

for Safety, Surety and Savings

...OPERATE DISTANT VALVES by LIMITORQUE REMOTE CONTROL

The important safety factor afforded by *LimiTorque Remote Control* cannot be overstressed, because men do *not* have to go to high, low, dangerous or inaccessible locations to open and close valves. Further, *LimiTorque* prevents damage to seats, discs, stems, etc., because it *"automatically" shuts-off the power,* should an obstruction in closing occur.

Think of the savings effected in time and money by eliminating men going from one valve to another (many of which are at distant locations)—not to mention the time required to shut or open each valve. *LimiTorque Remote Control* not only prevents this waste, but enables one man to merely *"push buttons"* and actually see on a panelboard whether the valves are open or closed.

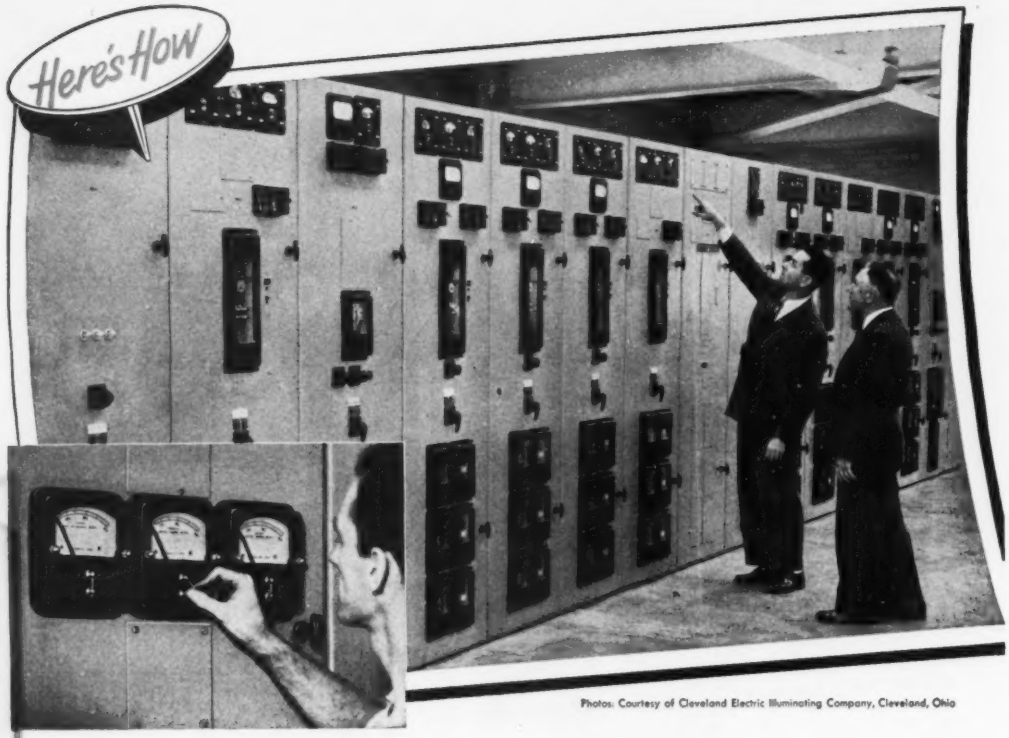
Various *LimiTorques* are available for different requirements on all types of valves (globe, gate, butterfly, plug, etc.)—and, too, *LimiTorques* may be supplied for actuation by any power source, such as electricity, steam, water, gas, oil or air.

LimiTorque can always be declutched for handwheel operation regardless of weather or electrical conditions. Send for our 96-page catalog, L-50, and please use your Business Letterhead when requesting it.

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON
IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls



Photos: Courtesy of Cleveland Electric Illuminating Company, Cleveland, Ohio

You can solve the problem of keeping loads balanced...

LINCOLN Thermal Ampere Demand Meters

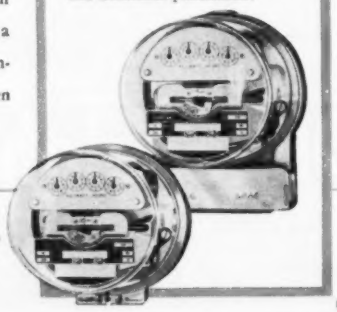
Because of today's constantly changing load requirements, you get the most out of your distribution system only when you keep loads between feeders balanced on the basis of *continuous* ampere demand information.

Permanently installed Lincoln Ampere Demand Meters give you the continuous measured facts. They show the value of current which remains on the feeders long enough to affect the carrying-capacity of the lines and distribution equipment. They're economical, too,—their cost is often paid for in one year by eliminating periodic surveys.

Lincoln Ampere Demand Meters are available for indoor and outdoor substations. When desired these meters can be furnished in types incorporating a self-contained ammeter to show immediately whether the load has been picked up when the feeder switch is closed. For full information, write for Bulletins 461 and 467.

Sangamo J Meters

These watthour meters meet today's requirements and tomorrow's anticipated loads with sustained accuracy, economy of maintenance and troublefree performance.



Only Measured Facts are Known Facts

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

Now...get better results from poor fuels!

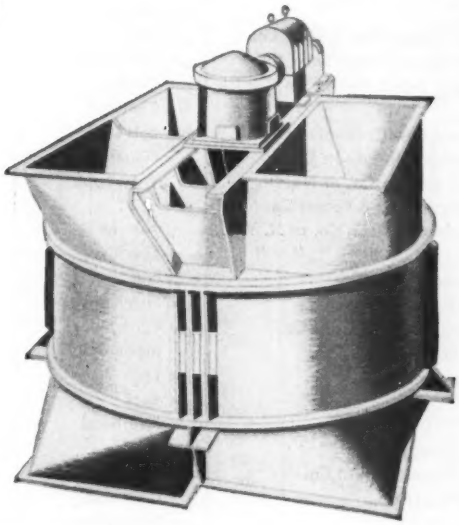
The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air.

Problems presented by today's available fuels hold fewer complications in those boiler plants equipped with Ljungstrom Air Preheaters.

High temperature combustion air is the key factor to efficient combustion of low-grade fuels, especially coals with high ash or moisture content. With the Ljungstrom Air Preheater it is possible to obtain higher preheat more economically.

In addition, the *continuous regenerative counterflow principle* of the Ljungstrom permits reliable operation at low exit gas temperature. This assures the greatest possible heat recovery . . . reduces the amount of fuel required.

If you are planning a new installation, or modernizing your present one, our engineers will welcome the opportunity to show you how the Ljungstrom can enable you to get better results from low-grade, less costly fuels.



THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

The Post War

✓ = C-E REHEAT BOILERS

REHEAT UNITS ORDERED FROM JANUARY 1, 1946 TO MAY 1, 1951

Name	Station	No. of Units	Throttle Pressure	Primary Temperature	Reheat Temperature	Kilowatts Max.-Capability (per unit)
Alabama Power Company	✓	2	1800	1000	1000	150,000
American Gas & Electric Co.						
Appalachian Electric Power Co.	Kanawha	2	2000	1050	1000	200,000
" " " "	Sporn	4	2000	1050	1000	150,000
Indiana Michigan Electric Co.	Tanners Creek	2	2000	1050	1000	150,000
" " " "	Twin Branch	1	2000	1050	1000	150,000
Ohio Power Co.	Muskingum	2	2000	1050	1000	200,000
Boston Edison Co.	✓ Edgar	2	1450	1000	1000	81,250
Carolina Power & Light Co.	✓ Goldsboro	1	1450	1000	1000	75,000
" " "	✓ Lumberton	1	1450	1000	1000	75,000
Central Hudson Gas & Elec. Co.	✓ Danskammer	1	1700	1000	1000	62,500
Central Illinois Public Serv. Co.	✓ Hutsonville	2	1450	1000	1000	75,000
Cincinnati Gas & Electric Co.	✓ Clermont	2	1450	1000	1000	100,000
" " " " "	Clermont	1	1450	1000	1000	125,000
Cleveland Electric Illum. Co.	✓ East Lake	3	1800	1050	1000	125,000
Commonwealth Edison Co.	Ridgeland	2	1800	1000	1000	125,000
Public Service Co. of No. Ill.	Waukegan	1	1800	1000	1000	125,000
Connecticut Light & Power Co.	✓	1	1450	1000	1000	75,000
Consolidated Edison Co. of N. Y.	Astoria	2	1600	1000	1000	150,000
" " " " "	East River	1	1800	1000	1000	150,000
Consumers Power Co.	Erie	2	1450	1000	1000	100,000
Dayton Power & Light Co.	✓ Hutchings	4	1450	1000	1000	62,500
Delaware Power & Light Co.	✓ Edge Moor	1	1450	1000	1000	75,000
Detroit Edison Co.	Marine City	2	1800	1000	1000	125,000
Duke Power Co.	✓ Lee	2	1250	950	950	100,000
" " "	✓ Buck	2	1800	1000	1000	125,000
" " "	✓ Riverbend	2	1250	950	950	100,000
Electric Energy Inc.	✓ Joppa	4	1800	1050	1000	150,000
Florida Power & Light Co.	✓	2	1450	1000	1000	75,000
Illinois Power Co.	✓ Hennepin	1	1450	1000	1000	75,000
" " "	✓ Wood River	1	1450	1000	1000	100,000
Jersey Central Power & Light Co.	S. Amboy	1	1700	1000	1000	62,500
" " " " " "	.....	1	1800	1000	1000	100,000
Kansas City Power & Light Co.	✓ Hawthorn	1	1450	1000	1000	100,000
Long Island Lighting Co.	✓ Far Rockaway	1	1450	1000	1000	100,000
" " " "	✓ Glenwood	1	1450	1000	1000	100,000
Metropolitan Edison Co.	✓ Titus	3	1450	1000	1000	75,000
New England Power Co.	Salem	2	1450	1000	1000	75,000
N. Y. State Electric & Gas Co.	✓ Dresden	1	1450	1000	1000	100,000
" " " " " "	✓ Goudey	1	1450	1000	1000	75,000

REHEAT Picture

REHEAT UNITS ORDERED FROM JANUARY 1, 1946 TO MAY 1, 1951 (continued)

Name	Station	No. of Units	Throttle Pressure	Primary Temperature	Reheat Temperature	Kilowatts Max.-Capability (per unit)
Niagara Mohawk Power Corp.	Albany	3	1450	1000	1000	100,000
" " " "	Dunkirk	2	1450	1000	1000	100,000
" " " "	Huntley	2	1450	1000	1000	100,000
" " " "	Oswego	1	1450	1000	1000	100,000
Ohio Edison Co.	Niles	2	1450	1000	1000	125,000
Pennsylvania Power Co.	New Castle	1	1450	1000	1000	100,000
Pacific Gas & Electric Co.	Contra Costa	2	1450	1000	1000	125,000
" " " " "	Moss Landing	2	1450	1000	1000	125,000
Pennsylvania Electric Co.	.....	2	1450	1000	1000	100,000
Pennsylvania Power & Light Co.	Sunbury	2	1450	1000	1000	125,000
Philadelphia Electric Co.	Crombie	1	1800	1000	1000	150,000
" " "	Delaware	2	1800	1000	1000	150,000
" " "	Schuylkill	1	1800	1000	1000	150,000
Public Service Elec. & Gas Co.	Kearny	2	2300	1100	1050	150,000
" " " " " "	Sewaren	1	1550	1050	1000	125,000
Public Service Co. of Indiana	Wabash	2	1450	1000	1000	100,000
Rochester Gas & Elec. Co.	Russell	2	1450	1000	1000	62,500
Rockland Light & Power Co.	Tomkins Cove	1	1700	1000	1000	62,500
South Carolina Elec. & Gas Co.	.....	2	1450	1000	1000	75,000
Southern California Edison Co.	Etiwanda	2	1800	1000	1000	125,000
" " " "	.....	2	1800	1000	1000	150,000
Tennessee Valley Authority	Kingston	4	1800	1000	1000	150,000
" " "	Shawnee	4	1800	1000	1000	150,000
Union Electric Co.	Meramec	2	1250	950	950	125,000
Utah Power & Light Co.	Salt Lake	1	1450	1000	1000	75,000
Virginia Electric & Power Co.	Chesterfield	1	1450	1000	1000	100,000
" " " " "	Gilmerton	1	1450	1000	1000	100,000
Wisconsin Electric Power Co.	Oak Creek	2	1800	1000	1000	120,000
" " " "	Pt. Washington	3	1450	950	950	80,000
Wisconsin Power & Light Co.	Beloit	1	1450	1000	1000	75,000

B-489

COMBUSTION ENGINEERING—SUPERHEATER, INC.

200 Madison Avenue, New York 16, N. Y.

WHEREVER YOU USE WOOD..

IN THE NORTH, poles must resist the tremendous weight of frequent sleet storms. Avoid preservatives which *weaken* the wood. Barrett* Coal-Tar Creosote allows poles to retain their maximum strength, and helps to keep the poles at their best and hold the lines aloft.

IN THE SOUTH, prolonged high temperatures cause light-bodied preservatives to leach and evaporate from the wood rapidly, thus exposing the wood to termite attack and decay. Barrett Coal-Tar Creosote, heavier bodied and of lower volatility, prevents this condition. It stays in the wood longer under all conditions—doesn't "run out" on the job.

IN THE DESERT, crossties broom, shatter and split from extreme dryness and heat. Solutions made with Barrett Coal-Tar Creosote retard this, and also reduce mechanical wear of crossties through their lubricating action on the wood fibers. In poles, heavy treatment with Barrett Coal-Tar Creosote substantially reduces checking and splitting.

IN THE SWAMPS, forces of decay are almost at their maximum of destructive power. High moisture content and infection from other decaying wood and debris are ever-present menaces. Poles properly treated with Barrett Coal-Tar Creosote have survived under swamp conditions for years.

IN FRESH WATER, many preservatives leach out of wood. Barrett Coal-Tar Creosote resists this leaching action. Being only negligibly soluble in water, it is the preferred preservative for use on submerged wood structures, or those exposed to the powerful action of rapidly flowing water.

IN SALT WATER, marine wood-borers give a preservative its severest test. Of hundreds of preservatives that have been tried through the years, *Coal-Tar* Creosote is the only one that has proved consistently effective against teredos, limnoria and other salt-water enemies of wood.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

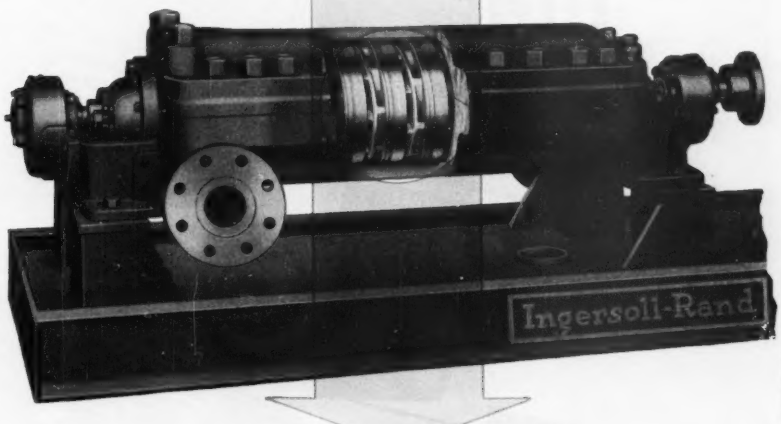
Only coal-tar creosote wood preservative has been used long enough and widely enough to have proved its effectiveness under all conditions.

Use Barrett* → **COAL TAR CREOSOTE**

*Reg. U. S. Pat. Off.

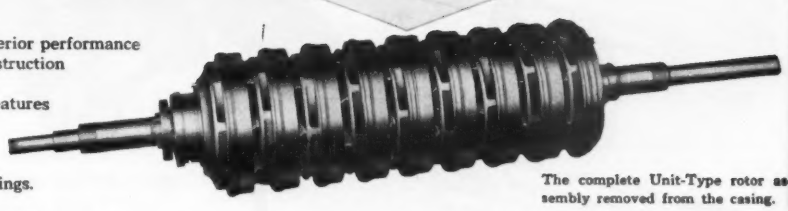
. . . here's the INSIDE STORY

on how the distinctively new HMTA can cut your high pressure pumping costs



A three-inch, nine-stage HMTA pump, with section of the casing cut away to show the rotor assembly installed.

● When it comes to superior performance and economy, it's the construction of a pump that counts. That's why the modern features of the Ingersoll-Rand Class HMTA pump mean so much to you in terms of long-range savings.



The complete Unit-Type rotor assembly removed from the casing.

SIMPLE, UNIT-TYPE ROTOR ASSEMBLY. Impellers, renewable wearing rings and stationary channel rings, containing the multiple volute fluid passages, make up the compact rotor assembly. Interstage sealing rings, compressed between the casing and channel rings, give a positive, metal-to-metal seal between successive stages. All rotor assembly elements are perfectly matched and self-aligning.

HIGH SUSTAINED EFFICIENCY. Multiple volute design, in-line staging and positive, interstage sealing contribute to the high efficiency of these units. And practical running clearances—proportioned for minimum wear—sustain this efficiency over years of service.

RUGGED CONSTRUCTION. The high-strength, symmetrical casing, is free from crossovers or cast volute passages. Complete radial and axial balance assures trouble-free operation over the complete range of pressures and capacities.

COMPACT, ACCESSIBLE DESIGN. The entire rotor assembly can be removed from or installed as a unit in the horizontally-split, smooth bore casing—without disturbing the piping. And the balancing drum, which is the only high pressure breakdown in the pump, can be inspected without opening the casing.

Ingersoll-Rand

Cameron Pump Division 590-10
11 Broadway, New York 4, N. Y.

HMTA

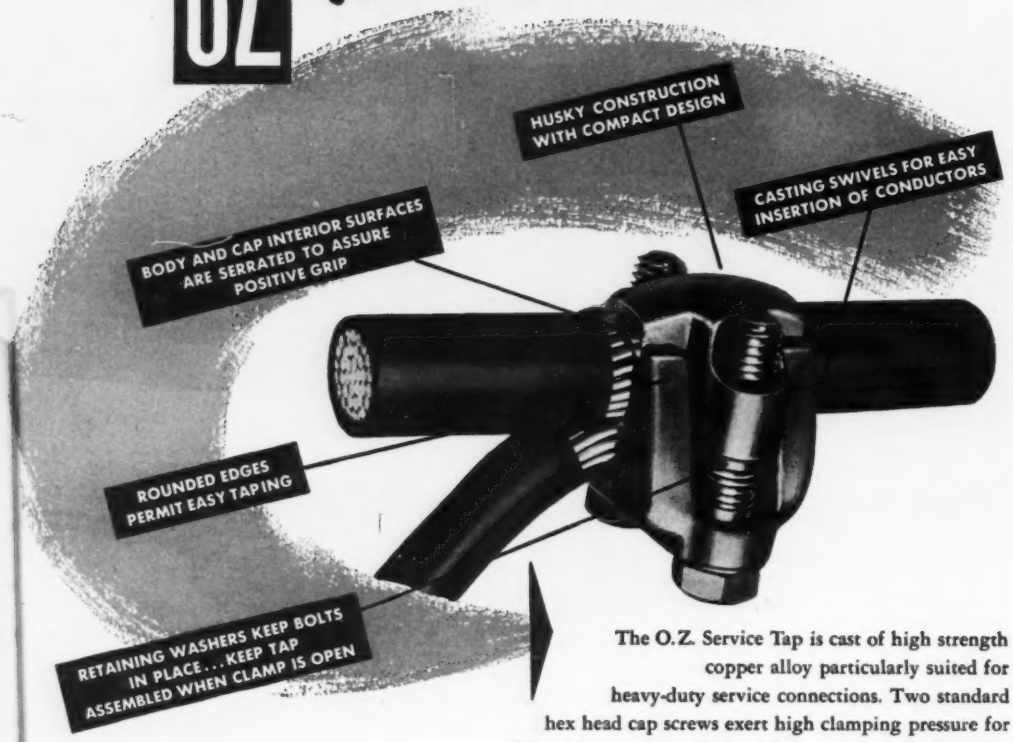
for pressures up to 1400 psi

Ingersoll-Rand Class HMTA pumps are available in capacities to 1600 gpm and pressures to approximately 1400 psi. For complete information on these *distinctively new* multi-stage pumps, write for your copy of Catalog 7233. Or ask your nearest Ingersoll-Rand branch office to give you the complete HMTA story.

COMPRESSORS • ROCK DRILLS
AIR TOOLS • CONDENSERS
DIESELS • GAS ENGINES
CENTRIFUGAL PUMPS

O.Z. SERVICE TAP

better from every angle


HUSKY CONSTRUCTION WITH COMPACT DESIGN
CASTING SWIVELS FOR EASY INSERTION OF CONDUCTORS
BODY AND CAP INTERIOR SURFACES ARE SERRATED TO ASSURE POSITIVE GRIP
ROUNDED EDGES PERMIT EASY TAPING
RETAINING WASHERS KEEP BOLTS IN PLACE... KEEP TAP ASSEMBLED WHEN CLAMP IS OPEN

The O.Z. Service Tap is cast of high strength copper alloy particularly suited for heavy-duty service connections. Two standard hex head cap screws exert high clamping pressure for low resistance connections. O.Z. bonus features guarantee service and satisfaction. And remember—O.Z. costs no more!

Available in sizes from #2 to 1000Mcm (Main) #10 to 1000Mcm (Tap). Can be furnished with spacer if desired for separating individual conductors. Will take two maximum size cables or one maximum and one smaller size. Excellent for dead-ending wires.

Buy O.Z. and you'll see why Engineers say, "They're OK if they're O.Z."

O.Z. ELECTRICAL MANUFACTURING COMPANY, INC.

262 BOND STREET · BROOKLYN 2, N. Y.

- CONDUIT FITTINGS
- CABLE TERMINATORS
- CAST IRON BOXES
- SOLDERLESS CONNECTORS
- POWER CONNECTORS
- GROUNDING DEVICES

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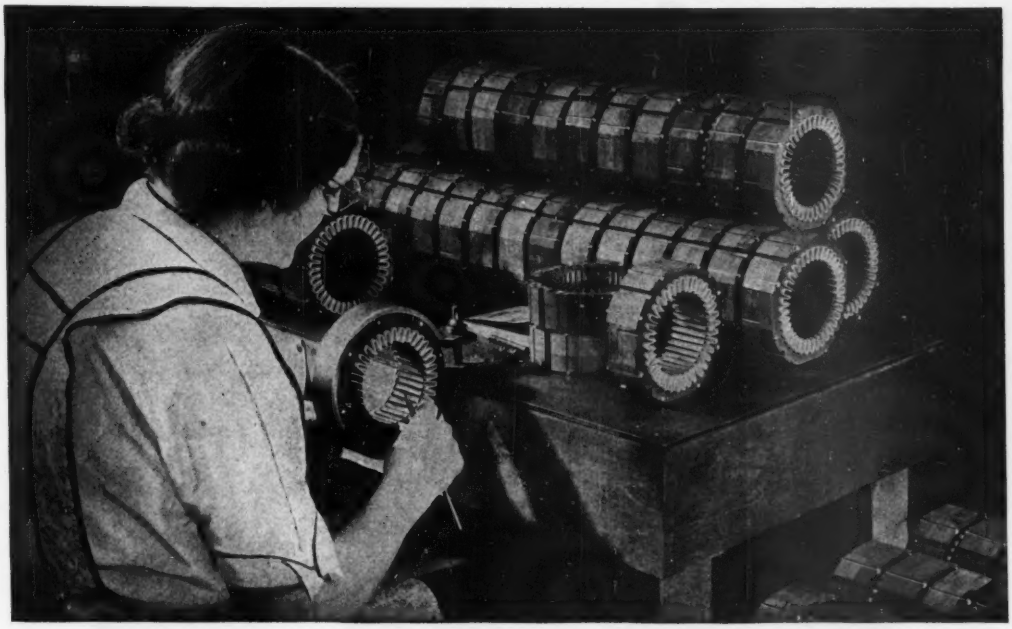


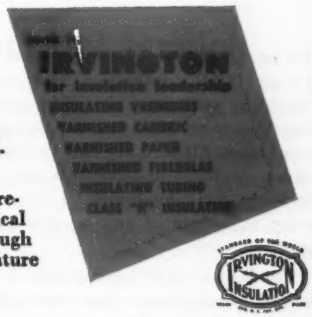
"Motors with IRV-O-SLOT insulation give year after year of service"

The Kingston-Conley Division of the Hoover Company uses Irvington IRV-O-SLOT insulation on its famous line of electric motors. Mr. A. E. Ott, Sales Engineer at Hoover, tells why:

"The high quality of the paper backing used in IRV-O-SLOT insulation has been fully proved by the many years over which our motors give satisfactory service. We find, too, that Irvington's slitting facilities give us greater flexibility in selecting paper widths, and allow us to shorten up our scheduling cycles."

These are among the reasons why IRV-O-SLOT has been the choice of many an electrical manufacturer, ever since Irvington introduced it as one of the *first* combined varnished-cambric-and-backing slot insulations.

The IRV-O-SLOT line now includes insulation for every slot requirement. Backing papers combine high dielectric and mechanical strength with ease of forming. Bonding adhesive allows enough "give" to prevent rupture of varnish film. IRV-O-SLOT literature is yours for the asking—just use the coupon below.



Send this convenient coupon now

Irvington

VARNISH & INSULATOR COMPANY

Irvington 11, New Jersey

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Irvington Varnish & Insulator Company
6C Argyle Terrace, Irvington 11, N. J.

Gentlemen:

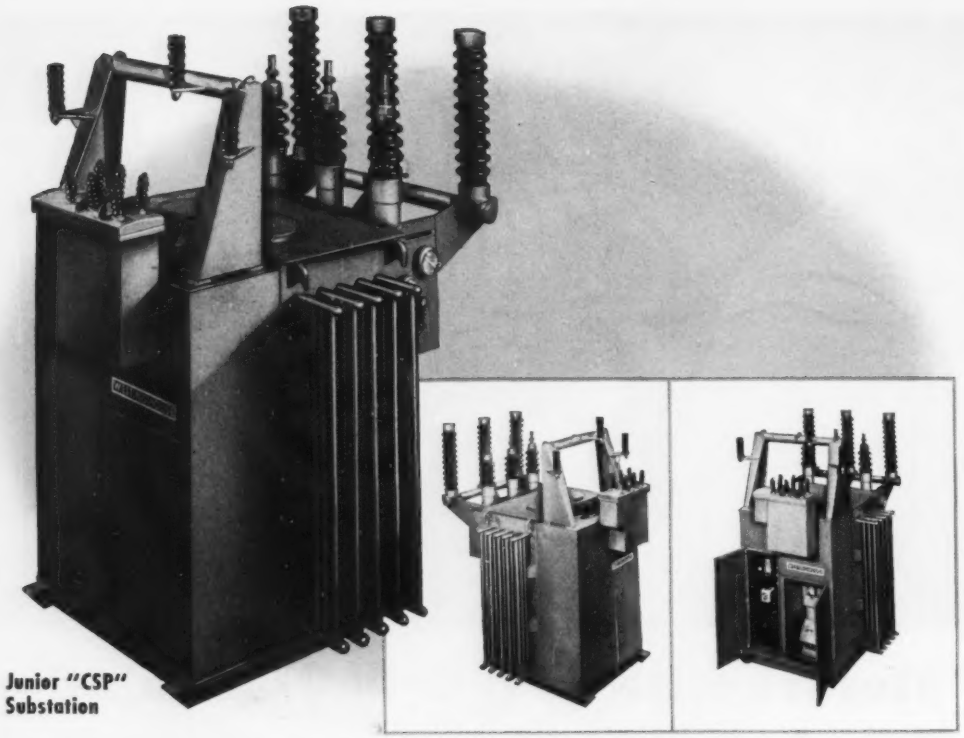
Please send me technical literature on IRV-O-SLOT insulation.

Name.....

Company.....

Address.....

City..... State.....



Junior "CSP" Substation

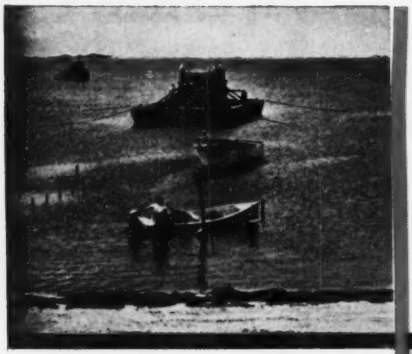
Greater Flexibility...Simplified Maintenance for SMALL CAPACITY FEEDERS

It's easy to move . . . easy to tie in. That's the new Junior "CSP" Substation, designed to give the flexibility needed for changing and growing loads. Completely enclosed construction gives all-weather protection. All parts are easily accessible . . . maintenance can be handled quickly and easily at ground level. In fact, the Junior "CSP" Substation gives every advantage of unit equipment . . . for *small* substation use.

The Junior "CSP" Substation is ideal for small towns . . . rural lines . . . and industrial plants where capacity of feeder does not justify a higher rating. It's a new design based on principles proved through years of dependable service with large "CSP" Substations. The Junior "CSP" (Completely Self-Protecting) Substation has both thermal and lightning protection built in. And it's completely factory-assembled with integral high and low-voltage switchgear, and metering equipment.

Available in ratings from 300 to 1,000 kva; others to 3,000 kva. For more information call your nearest Westinghouse representative, or write for Booklet B-4692, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-70584

YOU CAN BE SURE.. IF IT'S
Westinghouse
JUNIOR "CSP"
POWER TRANSFORMER



UNDER A BAY...

OR OVER A BRIDGE...

NEOPRENE

The rubber made by Du Pont since 1932

DU PONT

Tune in Du Pont "Cavalcade of America"—Tuesday evenings, NBC—coast to coast

You can depend on neoprene-jacketed cable for exceptional service

Today, neoprene-jacketed cable is the first choice of electrical engineers for aerial installations. Neoprene's unexcelled resistance to deterioration from continuous exposure to sunlight, weathering and heat means maximum life in outdoor service. For certain underwater installations, neoprene is gaining favor, too. Unlike metal sheaths, a neoprene jacket won't corrode, even when submerged in sea water for long periods. Neoprene's toughness and abrasion resistance help prevent damage during installation. And, because neoprene-jacketed cable is lighter and more flexible than metal armored types, savings are possible in transportation and installation costs.

Your supplier will be glad to tell you more about neoprene-jacketed cable. It is made in single or multiple conductor types, in voltage ratings to fit your requirements. New and interesting applications of neoprene are fully described in each issue of The Neoprene Notebook. Write today for your free subscription. E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Div., G-5, Wilmington 98, Del.

Hotpoint

Congratulates the Winners of the George A. Hughes Awards for 1950

Hotpoint joins the entire electric industry in extending congratulations to the winners of the George A. Hughes Awards for 1950. These awards have been won for outstanding achievement in the field of electric appliance sales and promotions—directly and through dealers.

As a result of the exceptional merchandising accomplishments attained by all participants in this competition, the entire industry has taken a big step forward. Because of the merchandising progress made by these utility companies, many new comforts are being experienced by their customers. Thus, we find the American people nearer the ideals of Electric Living.

Hotpoint welcomes the opportunity to salute these utility companies and their employees for what has been accomplished in earning the George A. Hughes Awards for 1950.

Florida Power & Light Co., Miami, Florida
- *1st prize*—Electric Kitchen Promotion
- *2nd prize*—Electric Range Promotion

Carolina Power & Light Co., Raleigh, N. C.
- *1st prize*—Electric Range Promotion
- *2nd prize*—Commercial Cooking Promotion

Kingsport Utilities, Inc., Kingsport, Tenn.
- *1st prize*—Electric Water Heater Promotion

Philadelphia Electric Co., Philadelphia, Pa.
- *1st prize*—Electric Dishwasher Promotion

Pennsylvania Power & Light Co., Allentown, Pa.
- *1st prize*—Commercial Cooking Promotion

Potomac Electric Power Co., Washington, D. C.
- *2nd prize*—Electric Kitchen Promotion

Indiana & Michigan Electric Co., Fort Wayne, Ind.
- *2nd prize*—Electric Water Heater Promotion

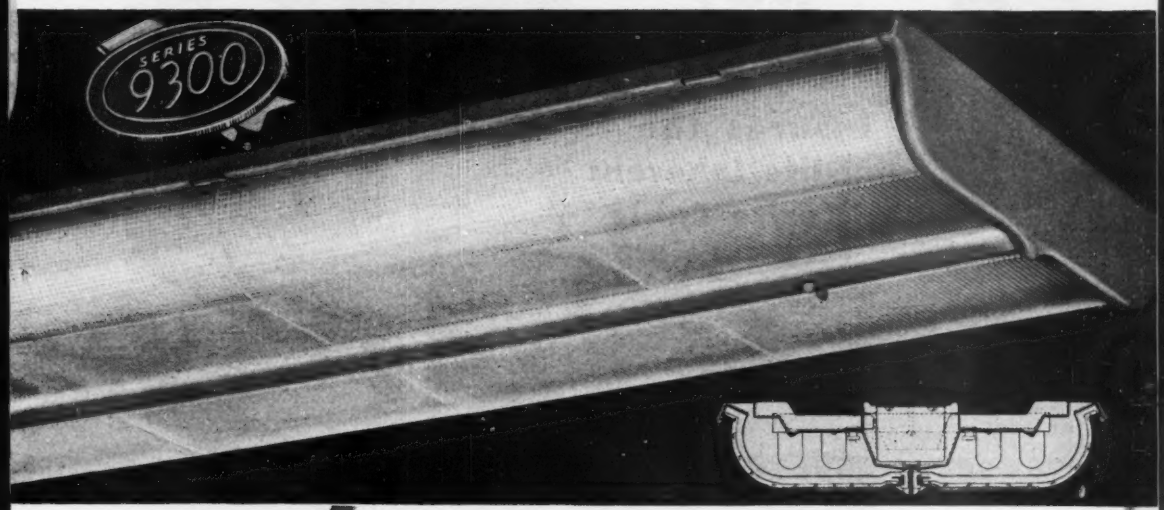
Central Arizona Light & Power Co., Phoenix, Ariz.
- *2nd prize*—Electric Dishwasher Promotion

Plan Now to enter the 1951 Competitions. Watch for details —to be announced soon.

Hotpoint Inc.

5600 W. Taylor Street, Chicago 44, Illinois

IT'S HERE! NEW HOLOPHANE Lighting Series..Introducing HIGH EFFICIENCY with MAXIMUM VISUAL COMFORT



Low Brightness

High Output

Easy Installation

Dramatic New Styling

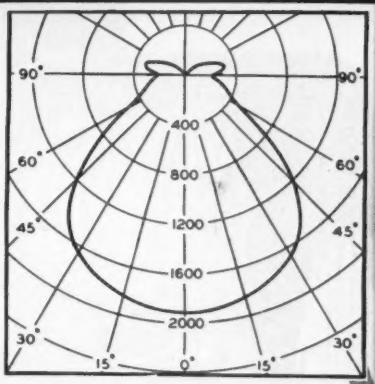
Continuous Installation

Bipin or Single Pin

Minimum Depreciation

Streamlined Styling

The shallow depth of the 9300 Series simulates the modern overall appearance of recessed units without the expense of roughing-in . . .



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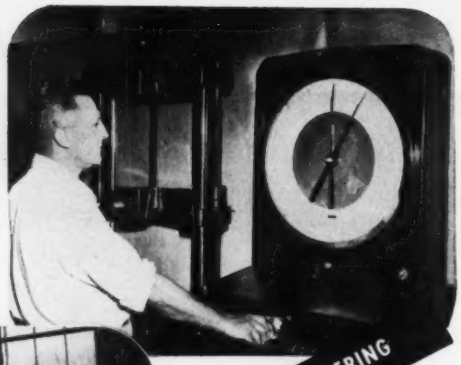

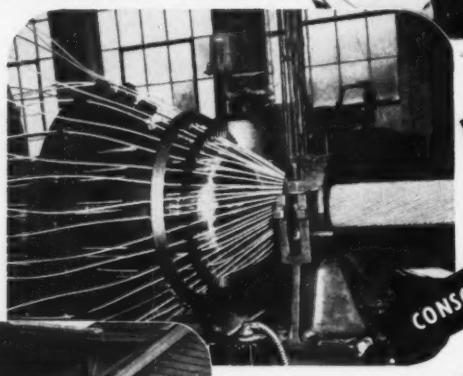

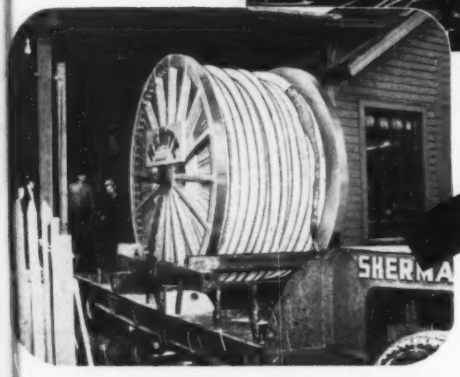

Kerite's 3-way protection of *quality*—through the finest possible engineering, workmanship, and handling—insures you a 3-way service benefit—the safety, reliability, and economy that are inherent in the insulation itself.

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Editorials

Leaders to Be Thankful For

Important developments in the art of central station service can readily be traced back to the 1920's. This era of industry progress and expansion was overshadowed, in the eyes of some, by malpractice on the part of financial interests. But omitting this surface impression we find a host of talented and energetic executives who made history in terms of technical, sales, and managerial accomplishments. We should be thankful for their great contributions to the strength of the industry as it exists today.

Many thoughtful people have suggested that today's leaders lack much of the ingenuity and forcefulness of those in similar positions 20 years ago. We have heard much talk about new capacity requirements, shortages, reserves, and a host of other matters relating to the mobilization program. But little has been said about those currently responsible for the electrical industry's plans and accomplishments to make America strong. We resort to the words of George Barlow in "The Song of Abu Klea," "What men have done can still be done and shall be done today." And we add—shall be done even better tomorrow.

Today on every side we find industry executives who are providing outstanding service to their companies, their industry and their country. We could name names of men in Washington, Ohio, New York, California, the East, West, North, or South who would illustrate our point. It can safely be said that the ingenuity and forcefulness found in leaders of the past exists twofold in those of today.

In this issue of "Electrical World" we have presented facts regarding the industry's place in the mobilization program. We have pointed out the problems and the trends that lie ahead. For this period of the industry's greatest expansion, it is reassuring for us all to know that we also have great leaders to be thankful for.

A Tribute to George Kable

According to present information the per farm income of West Virginia is the lowest in the nation. Figures from the 1950 census, when finally published, may show some other state at the bottom of the list. That will be as it should be because West Virginia is certainly at the top in trying to improve the condition of its farming.

This is written after a visit to Jackson's Mill, the state's 4-H Club camp. Camp in name only, it consists of some 20 buildings solidly built of stone and timber in a wide valley of the Appalachian Mountains. Of these, 13 are residence cottages, dormitories actually, built by and named for counties of the state. An average of over 100 organizations—farm education groups, farm women's clubs, agricultural organizations, farm leader training schools, and 4-H, FFA, and FHA groups—keep the camp busy the year round.

The camp had its beginning back in 1921 when a predecessor of the present Monongahela Power Co donated five acres of land for 4-H Club use. On the site was an old grist mill formerly operated by an uncle of "Stonewall" Jackson, and here the great general spent his boyhood. From the original five acres, the camp has now grown to 523.

Large among the activities at Jackson's Mill is the promotion of farm and farm home electrification. In a building devoted entirely to this purpose are shown and demonstrated hundreds of uses of electricity in farm work and living. The idea for this building came from the fertile mind of the late George W. Kable, whose name shines among the pioneers of farm electrification. The project was generously underwritten by the power companies of the state.

The terrain of West Virginia is only infrequently horizontal. Most of it is slanting at varying degrees of steepness. Some of it is practically vertical. It can hardly be called good farming country. But if determination to make the best of what it has, if the will to learn, if Jackson's Mill is truly representative of the state, then West Virginia will not remain forever at the bottom of the list in average farm income. It's a long pull and a hard one, but don't write off those mountain youths.

Symptomatic Operation

How many station operators know what the symptoms are when obscure mishaps occur? For example, the coupling on the exciter drive fails. Or a ground develops on the potential circuit for relays and meters. Or again, the supply fails to the motors driving the pen of traverse recorders. Will the centralized operators know how to interpret quickly whether any such possible troubles take place? Above all will they be able to decide quickly whether the difficulty is of such hazard as to warrant tripping a machine?

These are not imaginary events. They and many more like them have happened recently and in an unfortunate number of instances have disrupted whole stations. They are part of the penalty offsetting the benefits of centralized control. Nor is the answer solely one of providing more alarms and more automatic safeguards.

Staged faults on transmission lines are somtimes feasible and maybe staged faults in stations, even if only on paper, would be something to consider. Operators always have some unoccupied time in the control room, and they could well use this time to register in their minds what indications are symptomatic of certain abnormalities in the equipment. The engineers who designed the plant and supervise its operation should be able to set up some fine mental exercises for the operators. Each could be based on such mishaps as have happened elsewhere and "could happen here."

Let the operators dope out what their instruments and controls would show in each such case and then move on to decide what to do about it. Such a program of analysis of permutations and combinations could avert the loss of equipment and loss of capacity which has attended some cases where otherwise good operators could not or did not sense what was wrong. The gongs, lights, buzzers can be disconcerting even to a good operator if he lacks confidence in himself to interpret instantly what certain unorthodox combinations signify. Those who have developed such training know it works.

More Adhesives, Too

Discombobulations in supply of metals for civilian goods have not prevented makers of electric appliances from bringing out new models in their 1951 lines. Progress goes clicking right along. Refrigerators are smaller outside and bigger inside and additionally provide accommodation for half a steer to repose in frozen comfort. Ranges instinctively know the coming of unexpected company for dinner and obligingly enlarge their ovens to receive a bigger roast. Water heaters are equipped with automatic hammers for softening hard water. Ironers stack the shirts in gleaming piles of whiteness in the bureau drawers. Garbage disposers now hand back to the housewife the diamond ring she dropped in the kitchen sink. Every appliance, large and small, has built into it new features making it more efficient, more useful, more beautiful than before.

Different features are found in different makes of appliances. But there is one 1951 feature common to all. The manufacturers did not build this feature into their products. On the contrary, they did their best to build it out of them. It is there, nevertheless, and it makes 1951 appliances very different from those of last year. They are more adhesive. They stick tighter to the sales floor.

This feature of 1951 appliance lines, though it seems entirely otherwise, may actually turn out to be a very good thing indeed. It will if it does what it should do—revive the lost art of selling.

The Electrical Week

INDUSTRY MOBILIZATION—Chart of Engine and Turbine Division of NPA outlines organization and gives location of officials and their phone numbers (p 108) . . . The House Ways and Means Committee is considering higher taxes on electrical appliances (p 108) . . . The 2¢-a-lb duty on copper imports has been suspended (p 108) . . . The new "Product Assignment Directory" classifies products as CMP does (p 108) . . . Industry M Orders are listed on page 108.

WASHINGTON—Secretary Chapman asks the Senate Appropriations Committee to restore cuts made by House in Interior's power budget (p 112) . . . New Interior standard contract has clause regulating resale rates charged by municipalities supplied at wholesale (p 112) . . . Sepa has signed a contract with its first preference customer (p 114).

ELSEWHERE—Capacity reserve will be down to 8.8% by December, EEI semi-annual survey reveals (p 109) . . . AEIC and EEI meter committees are reorganized at meeting in Pasadena (p 111) . . . Restaurateur decries service given by suppliers on commercial cooking equipment before EEI Commercial Cooking Conference in Chicago (p 113) . . . Cable engineer reports on European design innovations (p 113) . . . Eleven Northwest private utilities will spend $500 million for five-year expansion program. NELPA Business Development Section hears (p 114) . . . New Jersey Utilities Association coordinates civil defense planning with state (p 115) . . . Florida utilities are now subject to state regulation (p 116).

• • •

War has broken out again between the United Electrical, Radio and Machine Workers, ex-CIO, and the International Union of Electrical Workers, CIO. UE has petitioned NLRB for an election at the East Pittsburgh plant of Westinghouse, where bargaining rights are held by IUE. The latter group will campaign to oust UE from all plants where it still has bargaining rights.

A late cold spell has fouled the British Electricity Authority. With 15% of its capacity out for maintenance and another 10% down for repair, BEA was forced early in May to shed 10% of its load for as long as five hours.

Because the Administration is vote-conscious, it doesn't want any unemployment. Therefore, it will take materials from essential industry to keep the civilian economy high. For the same political reason there is no civil agency in Washington—the White House, Congress, or defense agency—which has the nerve to tell the people that they must curtail their use of electricity.

ODM, NPA, and the Interior Department are in agreement in one respect. They all say that we must go ahead with the power-expansion program.

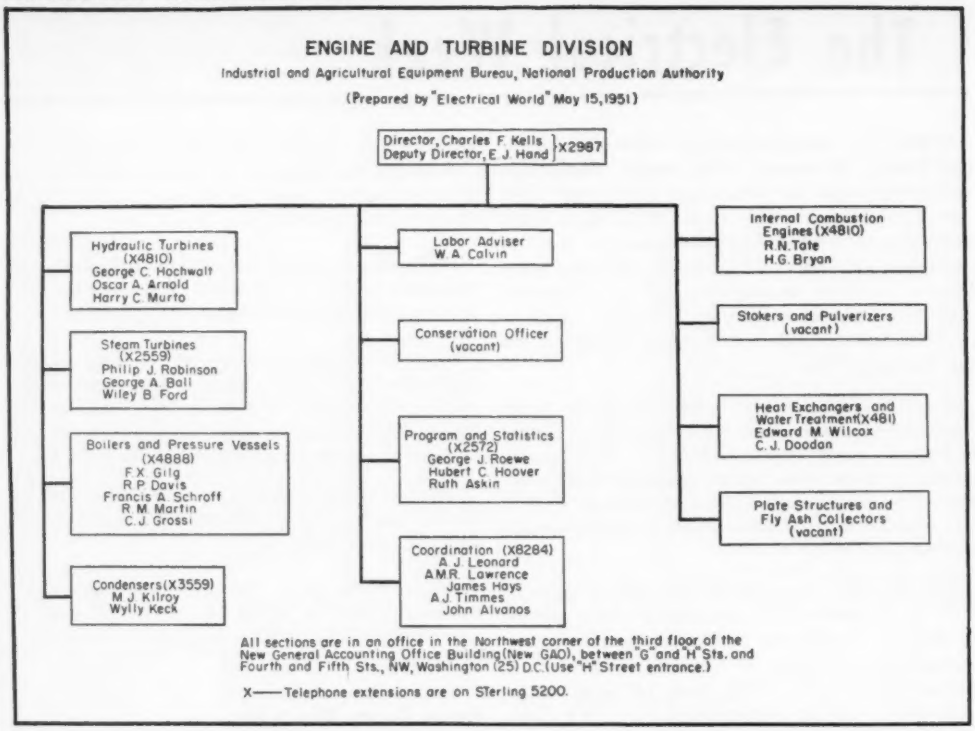
Defense Minerals Administration has asked for $40 million for the next fiscal year to continue a government-subsidized exploration program for scarce metals. The money would come from a $1-billion fund Congress will be asked to put up for defense production incentives.

Installed capacity of projects from which Interior markets power is now 4,210,300 kw, compared with 2,671,800 kw in 1945.

Despite the plan of the Federal Communications Commission to "thaw" its orders "freezing" the number of TV stations, it will be 1952 or later before any new ones go on the air.

Notes From The News

Arthur Whybrow of Southend, England, has been charged with attempting to murder his wife. He rigged up a 230-volt line to the bathtub, police said, and switched on the current when she stepped in. It came as quite a shock to Mrs. Whybrow. She was jolted out of her bath—unhurt . . . Sites for substations in Allentown, Pa., are really scarce. Recently Pennsylvania Power & Light Co had to buy and tear down two garages in a multi-garage unit to prepare a site. One of the car-owners dispossessed was a PP&L distribution engineer . . . Over in Rockledge, Pa., the populace of 1,700 was without electricity for 20 minutes recently because a bee stung James Johnson on the nose. Johnson was driving near Rockledge when it happened, and he crashed into a utility pole. The impact broke overhead lines supplying the community with power . . . The Thetford, England Gas Board recently installed its latest type gas street lamp outside the headquarters of the local Electricity Board. Explained a gas official: "We thought it might be useful during power cuts" . . . The Bethesda, Md., substation of Potomac Electric Power Co is back in service after a 5½-month outage. The station suffered damage estimated at $200,000 when it was struck by lightning during the severe storm that hit the East Nov. 25, 1950.



House Group Reveals Increased Tax Trends

The House Ways and Means Committee has given the first tipoff on the new excise taxes that will eventually raise the retail price of many electrical appliances.

In the first round of votes on the new tax bill, the key tax committee has tentatively approved higher rates on items already taxed and showed it intends to tax many appliances that have been tax free.

The committee will take another look at the "tentative" decisions before the bill goes to the House floor. Further changes may be made by the House itself, the Senate Finance Committee, and finally the Senate before the new rates become effective.

Here are the excises the Ways and Means Committee voted on the first go-around:

The committee refused to increase the tax on appliances from 10 to 25% as the Treasury wished. But other items were made subject to the 10% tax for the first time. These electric appliances include: Dishwashers, mangles, clothes dryers, garbage disposers, dehumidifiers, food choppers and meat grinders, ice cream freezers, home moving picture projectors, and automatic timing devices (Revenue increase, $20 million).

Other excise tax changes:

A 5% increase (from 10 to 15%) on radio and television sets. The treasury had recommended a 25% tax.

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Copper Duty Suspended

Congress has approved suspension of the 2¢-a-lb import duty on copper until Feb. 15, 1953, or the end of the present emergency, whichever is sooner.

•

Product Directory Ready

"Product Assignment Directory and Official CMP Class B Product List" is the latest publication of the National Production Authority. The booklet enables a manufacturer to tell what NPA industry division controls the products which he makes. It also classifies products as to CMP classification. Copies can be secured from any field office of the Department of Commerce or from the National Production Authority, Washington 25, D. C.

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Industry M Orders

National Production Authority has issued the following M orders of interest to the electrical industry. Orders not of interest have been omitted. Copies of orders may be secured from the National Production Authority, Washington 25, D. C., or any regional Department of Commerce office.

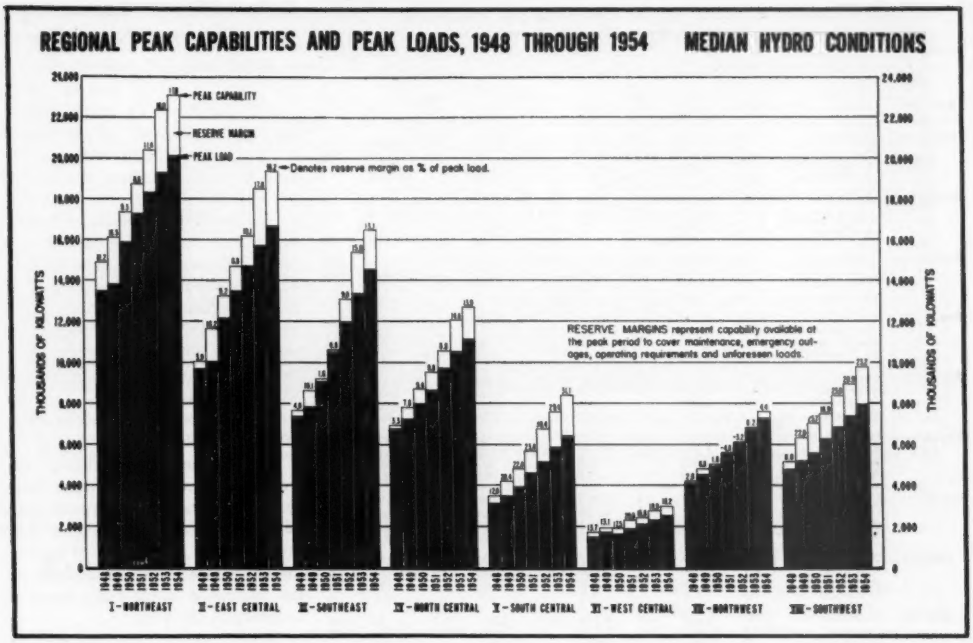
Amendments to Previous Orders

Amendment to M-3 allows more flexible restrictions on use of **columbium** and **tantalum** to assure higher production of steel containing these alloys.

CMP Regulations

Reg 2 sets limits on amounts of controlled materials a user may have in inventory.

Reg 4 establishes rules for deliveries of steel, copper, and aluminum by warehouses, jobbers, dealers, and retailers.


REGIONAL PEAK CAPABILITIES AND PEAK LOADS, 1948 THROUGH 1954 MEDIAN HYDRO CONDITIONS
PEAK CAPABILITY
RESERVE MARGIN
PEAK LOAD
Denotes reserve margin as % of peak load.
RESERVE MARGINS represent capability available at the peak period to cover maintenance, emergency outages, operating requirements and unforeseen loads.
THOUSANDS OF KILOWATTS
I - NORTHEAST
II - EAST CENTRAL
III - SOUTHEAST
IV - NORTH CENTRAL
V - SOUTH CENTRAL
VI - WEST CENTRAL
VII - NORTHWEST
VIII - SOUTHWEST

Capacity Reserve Set at 8.8% in 1951

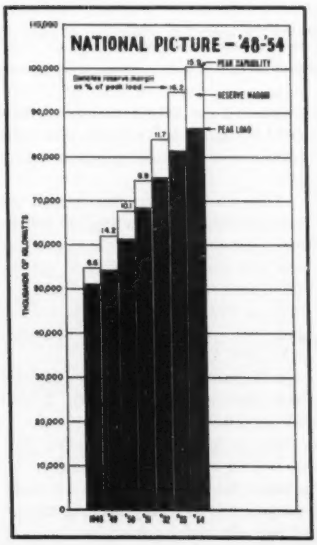
EEI Survey Reveals Industry Is Ready to Carry All Predictable Loads; Only 2 FPC Regions May Have Difficulty; Margin to Grow

Reserves of generating capacity of the nation's electric utility systems will total only 8.8% in December, the ninth semi-annual electric power survey of Edison Electric Institute reveals. This reserve will be smaller than in the past two years (See chart), but it is expected that reserve will increase sharply in the next two years.

The survey covers approximately 95% of the capability and 98% of the energy output of the electric power systems in the United States. Both business-managed and public systems are included. Data supplied was as of early April.

Median hydro conditions were assumed in estimating the 8.8% reserve for the coming December. Adverse hydro conditions could revise the margin downward to 4.9%. But it is inconceivable that adverse hydro conditions will prevail in all sections of the country.

Optimistic as the reserve figure is for the nation as a whole, there is one region which shows not margins but deficits. The Western Division of Region VII (Pacific Northwest) shows a deficit of 7.6%. This is balanced somewhat by a margin of 7.1% in the Eastern Division so that the deficit for the entire region is only 4.8%. Furthermore, there are many industrial consumers in this region buying power on an interruptible basis that can be cut off if the need arises.



Region III, the rapidly expanding Southeast, shows a reserve of only 0.8% for the coming December. Since this region has much hydro capacity, it can be in trouble if water conditions are bad.

All other regions have ample capacity to handle all foreseen loads.

By December 1952 all regions but the Pacific Northwest will have ample reserves. This area will still be 3.2% on the low side. Reserve in 1953 will rise to 0.2% and the following year to

Peak Capabilities, Peak Loads and Reserve Margins Through 1954
Thousands of Kilowatts—Median Hydro Conditions

% Increase = Percentage of Increase Over Preceding Year

Regions*		1950**	1951	% Inc.	1952	% Inc.	1953	% Inc.	1954	% Inc.
Region I	Capability	17,388	18,788	8.1	20,440	8.8	22,407	9.6	23,114	3.2
	Peak Load	15,908	17,299	8.7	18,355	6.1	19,316	5.2	20,142	4.3
	Margin of Res.	1,480	1,489		2,085		3,091		2,972	
	% Reserve	9.3	8.6		11.4		16.0		17.8	
Region II	Capability	13,262	14,707	10.9	16,190	10.1	18,514	14.4	19,356	4.5
	Peak Load	12,150	13,516	11.2	14,702	8.8	15,721	6.9	16,662	6.0
	Margin of Res.	1,112	1,191		1,488		2,793		2,694	
	% Reserve	9.2	8.8		10.1		17.8		16.2	
Region III	Capability	9,218	10,636	15.4	13,114	23.3	15,405	17.5	16,482	7.0
	Peak Load	9,076	10,550	16.2	12,030	14.0	13,390	11.3	14,570	8.8
	Margin of Res.	142	86		1,084		2,015		1,912	
	% Reserve	1.6	0.8		9.0		15.0		13.1	
Region IV	Capability	8,768	9,547	8.9	10,616	11.2	12,121	14.2	12,718	6.3
	Peak Load	8,013	8,694	8.5	9,753	12.2	10,599	8.7	11,162	5.3
	Margin of Res.	755	853		863		1,522		1,556	
	% Reserve	9.4	9.8		8.8		14.4		13.9	
Region V***	Capability	4,856	5,740	18.2	6,817	18.8	7,666	12.5	8,457	10.3
	Peak Load	3,968	4,653	17.3	5,228	12.4	5,926	13.4	6,452	8.9
	Margin of Res.	888	1,087		1,589		1,740		2,005	
	% Reserve	22.4	23.4		30.4		29.4		31.1	
Region VI	Capability	1,961	2,334	19.0	2,457	5.3	2,791	13.6	2,973	6.5
	Peak Load	1,669	1,931	15.7	2,122	9.9	2,328	9.7	2,515	8.0
	Margin of Res.	292	403		335		463		458	
	% Reserve	17.5	20.9		15.8		19.9		18.2	
Region VII	Capability	5,085	5,397	6.1	5,987	10.9	6,880	14.9	7,685	11.7
	Peak Load	4,994	5,671	13.6	6,188	9.1	6,864	10.9	7,364	7.3
	Margin of Res.	91	(274)		(201)		16		321	
	% Reserve	1.8	(4.8)		(3.2)		0.2		4.4	
East Div.	Capability	994	1,129	13.6	1,268	12.3	1,327	4.7	1,555	17.2
	Peak Load	921	1,054	14.4	1,169	10.9	1,263	8.0	1,314	4.0
	Margin of Res.	73	75		99		64		241	
	% Reserve	7.9	7.1		8.5		5.1		18.3	
West Div.	Capability	4,091	4,268	4.3	4,719	10.6	5,553	17.7	6,130	10.4
	Peak Load	4,073	4,617	13.4	5,019	8.7	5,601	11.6	6,050	8.0
	Margin of Res.	18	(349)		(300)		(48)		80	
	% Reserve	0.4	(7.6)		(6.0)		(0.9)		1.3	
Region VIII	Capability	7,112	7,549	6.1	8,487	12.4	9,009	6.2	9,856	9.4
	Peak Load	5,660	6,350	12.2	6,900	8.7	7,450	8.0	8,000	7.4
	Margin of Res.	1,452	1,199		1,587		1,559		1,856	
	% Reserve	25.7	18.9		23.0		20.9		23.2	
TOTAL U.S.	Capability	67,650	74,698	10.4	84,108	12.6	94,793	12.7	100,641	6.2
	Peak Load	61,438	68,664	11.8	75,278	9.6	81,594	8.4	86,867	6.5
	Margin of Res.	6,212	6,034		8,830		13,199		13,774	
	% Reserve	10.1	8.8		11.7		16.2		15.9	

*Approximately as defined by Federal Power Commission.

**Actual Operating Results.

***In Region V the summer peak loads are approximately 12% higher than in December; therefore, the summer reserve margins are correspondingly less than the December margins shown.

Reserve Margins represent capability available at the peak period to cover maintenance, emergency outages, operating requirements and unforeseen loads.

4.4%—again if median hydro conditions prevail.

The survey brings out the tremendous increase in capability planned for the nation's systems. During the period 1951 through 1953 capability is scheduled to increase 31% faster than indicated by the eighth semi-annual checkup. Capability is estimated at 74,498,000 kw at the end of this year. For the next three years the figures are 84,108,000, 94,793,000, and 100,641,000 kw. This last capability total is 85% higher than the 54,436,000-kw total which was reported in 1948.

The big factor involved in the capability situation is that of materials. At this time no one can safely predict that manufacturers of heavy equipment will get all the materials they need to make deliveries in time. Deliveries now are running behind schedule.

This newest survey also brings out the difficulty of predicting the future. Since last Oct. 1, when the eighth survey was made, the prediction for the 1951 peak has gone up 3,617,000 kw, that for 1952 has risen 5,996,000 kw, and that for 1953 has increased 8,337,000 kw.

In the same time capability estimates have increased only 63,000, 2,427,000, and 6,967,000 kw.

But it must be remembered that even with these divergent rates of increases the previously stated reserve margins will still keep the country out of any difficulties powerwise.

Offers Plan to Reconcile Fish and Power Camps

A new proposal designed to reconcile fish and power interests on the Deschutes River in central Oregon has been submitted to the Federal Fish and Wild Life Service and Oregon Fish Commission by Portland General Electric Co.

The power company has offered to construct a reregulating dam at a cost of $3 million and contribute 1 million to the state for fish handling if the state and federal services will act favorably on PGE's request for permission to build the Pelton Dam on the Deschutes, near its confluence with the Metolius River. The offer would boost cost of the Pelton project to $22 million.

The proposed reregulating dam would be located three miles below the Pelton Dam. Its purpose would be to stop excessive fluctuation in the flow from the power dam. It has been the contention of fishing interests that this fluctuation would prove disastrous to fishing in the area.

The $1 million contribution to the state would be used to enlarge the hatchery on the Metolius and provide other fish-handling facilities. In addition to this contribution, PGE agrees to pay up to $100,000 a year for extra handling needed for taking eggs from holding ponds above the reregulating dam to the hatchery and then trucking fingerlings back for release below the dam.

PGE asked the state and federal services to reconsider the Pelton project, which has been blocked in the past by opposition of fish interests, in view of the nation's power requirements in the present emergency.

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Pacific Gas & Electric Co Plans to Add 500,000 Kw

Pacific Gas & Electric Co has announced plans to add an additional 500,000 kw of steam-generated power to its northern California capacity.

Four 125,000-kw generators have been ordered, to be installed at locations not yet finally determined. One of these is expected to be on the line by late 1953.

With these additions, PG&E's system will have increased 2,306,000 kw since V-J Day at a total cost of more than $1 billion.

EEI AND AEIC METER group leaders at the spring meeting. Left to right are Pres William C. Mullendore, Southern California Edison Co, who spoke; AEIC Committee Chairman F. H. Rogers, Consolidated Gas, Electric Light & Power Co of Baltimore; EEI Committee Chairman H. A. Brown, Rochester Gas & Electric Corp; and Meeting Chairman F. A. Redding, SCE

AEIC and EEI Meter Committees Reorganized at Pasadena Meeting

The Edison Electric Institute meter and service committee and the Association of Edison Illuminating Companies committee on metering and service methods were reorganized and coordinated at their joint spring meeting in Pasadena May 7-9.

Under the reorganization plan, each group will retain its individual identity and will have its own chairman. Subcommittees will be combined under four divisions — service equipment, meters and metering equipment, codes and rules, and meter department management—each headed by a chairman appointed jointly. Chairmen of the parent committees will have staggered two-year terms, but chairmen of the four divisions will be changed annually.

Each of the four divisions will have from three to ten subcommittees. These joint subcommittees eliminated duplication of subgroups and functions in the twin organizations.

Most serious problem discussed at the meeting was the materials situation, which threatens to curtail seriously watt-hour meter production. J. C. Langdell, Commonwealth Associates, previously appointed to investigate the situation, reported that meter manufacturers will be unable to get copper to continue needed watt-hour meter production if manufacture of appliances and other products continues at the present rate. He appealed to members of the committee to submit factual information on meter requirements, along with any available data to document the saving in copper that can be realized by avoiding unmetered circuits. One utility, he said had estimated on the basis of actual experience that the amount of copper required all the way back to the generating station to serve metered loads was 40% less than to serve the same loads unmetered. On that basis, he said, one pound of copper used in a watt-hour meter can save about 14 lb otherwise required to serve an unmetered load.

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Orders 4 Gas Turbines

Four 5,000-kw gas-turbine generators have been ordered by Connecticut Light & Power Co for installation in 1952 and 1953. They will be located at ends of the transmission system for peak and emergency operation.

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Quits Colorado Commission

John R. Barry has resigned from Colorado's Public Utilities Commission to enter private law practice.

Arizona Edison Books Opened to Rate Study

The first state utility rate study in Arizona is being conducted on books of the Arizona Edison Co, power, gas, and water supplier in ten districts.

The study is being made prior to a formal public hearing on the company's request for an 8% rate increase. It involves boosts in service charges to 48,000 customers.

This is the first time in the state that an advance investigation has been possible on a rate application to determine if it is fair and necessary. The recent legislature set up a $50,000 fund to finance the rate bureau.

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Needs Billion Kwhr a Year

Although the detailed breakdown is not available for security reasons, it has been learned that the total annual power requirements of the Basic Magnesium Plant, Henderson, Nev., will exceed a billion kwhr within a year as planned expansion nears completion.

•

Plans 600,000-Kw Plant

Public Service Co of Illinois, a subsidiary of Commonwealth Edison Co, has bought a site for a 600,000-kw station on the Sanitary and Ship Canal a few miles north of Lockport, Ill. The company expects to place an order for the first 150,000-kw generating unit sometime this year.

Senate Is Asked to Restore Funds Cut from Interior Budget by House

Secretary of the Interior Oscar L. Chapman has asked the Senate Appropriations Committee to restore funds cut from Interior's fiscal 1952 requests by the House of Representatives (EW, May 14, p 12).

A House amendment by Rep Kenneth Keating, New York Republican, came in for the bitterest attack. The amendment would prevent the Bureau of Reclamation from constructing transmission lines in areas served by private electric utilities which have "wheeling" agreements with the bureau. Chapman charged the Reclamation power program would be strangled if the Keating amendment were written into law.

Amendment Called Insidious

"The Keating amendment is the most insidious device that could have been used to undo much of the work that has been accomplished so far in reaching 'wheeling' agreements," Chapman argued. "It puts the department at the complete mercy of the private utilities."

Because the National Advisory Committee for Aeronautics has signed a power contract with Virginia Electric & Power Co, Chapman said no further funds would be sought for the controversial Buggs Island-Langley Field line. The House action in deleting all of Sepa's construction funds is "indeed serious," the Secretary commented.

SPA Fund Cut Opposed

House cuts in funds for Southwestern Power Administration would result in loss of investment already made for construction, the sub-committee was told. The House cut out SPA funds for miscellaneous construction and the Western Missouri Project.

A slash of $5.5 million in Bonneville Power Administration's construction funds, Chapman said, would make it necessary to delay completion of a number of facilities on which construction has begun or which will be started in fiscal 1952.

An amendment by Rep. Ben Jensen, Iowa Republican, which provided that Interior, with certain exceptions, could fill only 25% of the vacancies that occur during the fiscal year also aroused Chapman's ire.

"There has never been a proposal," he declared, "which would result in a more complete breakdown of government operations than would this amendment if it became law."

The subcommittee is continuing its study of the bill.

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Los Angeles Planning 320,000-Kw Station

Department of Water & Power in Los Angeles is conducting negotiations for land purchases in the Pacoima area of San Fernando Valley for a $58-million steam plant.

The station will ultimately consist of four generating units, with a total rating of 320,000 kw and a maximum capability of 400,000 kw. First two units are expected to be in operation by 1953, and the four by 1958.

New Interior Contract Has Resale Rate Item

A new standard contract clause that gives the Department of Interior regulatory rights concerning resale rates charged by municipalities supplied at wholesale by three of its agencies has been approved by Secretary Chapman.

The article provides that municipal systems purchasing wholesale power from Bureau of Reclamation, Southwestern Power Administration, and Southeastern Power Administration must account for the operation of their systems as separate departments and make annual financial statements to the government agency.

The government may then ask the municipality to lower its rates, and may terminate the contract on three years' notice if rate schedules are not revised to its satisfaction. Contracts will not be terminated where a requested rate revision is rejected by a regulatory body having jurisdiction over the municipal system.

Reclamation officials said 31 municipalities served by the bureau under preference customer provisions of the law bought 2.8 billion kwhr in 1950.

THAT'S WATER, not electricity, spilling out of a utility pole in Pittsburgh. A water main burst directly beneath the hollow metal pole, and cars got a bath

CIGARETTE PAPER, exhibited by Louis Domenach (left), chief engineer, Les Cables de Lyon, France, inspired him to develop a 400-kv cable insulated with very thin tapes. Domenach rolls his own cigarettes. Others in the group are Domenach's assistant (unidentified), K. S. Wyatt, engineer of cables, Phelps-Dodge Copper Products Corp, M. Just, works manager of Cables de Lyon and Mme. Beaufreres, who acted as interpreter for the group during Wyatt's stay at Lyon, France

Service Offered on Cooking Devices Is 'Putrid,' Restaurateur Informs EEI

"Putrid" was the word used by Andrew J. Crotty, Jr, to describe service given by suppliers on electric commercial cooking equipment. Crotty, past president of the National Restaurant Association and a member of the firm of Crotty Bros, Inc, Boston, in-plant food service operators, spoke at the EEI-sponsored Commercial Cooking Conference in Chicago, May 9.

"In general," he said, "we love electrical equipment." But, he added, some utilities do not seem to have the same love. Much equipment offered today could be improved, he said.

Ralph Smith, Grace E. Smith Cafeteria Co, Toledo, also criticized service offered by suppliers. As a cure, he suggested local agencies be set up and operated jointly by suppliers of different makes of cooking equipment.

Mechanically, the restaurant industry is the most backward of all, Smith said. It still depends too much on human labor in moving, handling, lifting, and piling. Restaurant operators, he said, need more help from suppliers in unloading equipment and setting it in place. He said better crating and more complete instructions for assembly were needed.

M. P. Duke, Duke Manufacturing Co, St. Louis, maker of food service equipment, took issue with Smith and Crotty. As is usually the case, he said, people have better memories for the bad than the good. The food service industry needs the help of utilities and manufacturers of electric cooking devices, he said, but utilities cannot refuse to accept some responsibility in servicing equipment. They should see to it that the equipment-user gets the service he needs, he said.

Electric commercial cooking equipment must continue to be produced in time of defense preparation, H. B. Blakeslee, chairman of NEMA's Commercial Cooking Equipment Section, told the group. The food service industry, he said, is comprised of a half million places serving 65 million meals daily. It spends more than $100 million a year for new equipment. Of this, $80 million is for replacement equipment. Thus, he said, if production were excessively reduced, replacement of equipment would soon become a very serious problem.

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Joins PUD Association

Kenneth I. Billington, former personnel director of Clark County PUD at Vancouver, Wash., has been elected executive secretary of Washington PUD Commissioners' Association, with offices in Seattle. He replaces John McCauley, who has joined the staff of Rep Henry Jackson in Washington, D. C.

Cable Engineer Reports European Innovations

Denmark has 26 installations in process of 69 to 132-kv buried cable and is using radioactive gases as tracers for leaks in cable sheaths. Britain is making aerial telephone cable up to ¾-in. diameter with longitudinally welded stainless steel sheath. Sweden has a 400-kv stretch of cable.

These are observations reported by K. S. Wyatt of Phelps-Dodge Copper Products Corp during a recent European technical trip concentrated on 220-kv cable developments. He said Europe everywhere is seeking an inexpensive buried cable for 69 kv and above. Mollerhoj of Denmark has 26 installations of cable which has a flat construction in which the dielectric is impregnated in the sheath at time of fabrication, with oil pumped in at the site to expand the flat side. A bronze spring then regulates the expansion to conform with ambient and loading temperatures. No reservoirs or other accessories are required. Pirelli of Southampton and Enfield have taken licenses to manufacture in England.

Cables de Lyon made some of the cable for the Swedish 300-kv system. The thin paper construction is founded on tests inspired by engineer Louis Domenach's habit of rolling his own cigarettes with a very thin paper.

Pirelli of England has replaced the aluminum sheath with 31-mil stainless steel and a longitudinal weld for aerial communication cables. The cold-weld technique was tried out for aluminum but abandoned because the weld would not survive flexing, according to Wyatt.

•

Co-op to Show Farmers Best Use of Electricity

How the farmer can best put electricity to work for increased production and profits is the subject of a $100,000-member-education program recently approved by the ten member cooperatives of Minnkota Power Cooperative, Inc.

The Minnkota group serves 35,000 farms in northwestern Minnesota and northeastern North Dakota. The new program, to be carried out in cooperation with manufacturers and dealers, will include newspaper and radio advertising, direct mail, publications, and promotion activities by members.

BUSINESS DEVELOPMENT was discussed at NELPA meeting by H. M. Kelley, left, Frigidaire; Guy E. Davis, Pacific Power & Light Co; George T. Bragg, PP&L, and Thomas W. Delzell, Portland General Electric Co and association president

NW Utilities Will Spend Half Billion for 5-Year Expansion, Group Hears

Eleven privately owned utilities in the Pacific Northwest will spend between $539 million and $586 million on system expansion during the next five years. Included will be 1,446,000 kw of new generating capacity. This building program is in addition to the vast expansion of federally financed power facilities in the region during the same period.

These facts were brought out in a forum on financing, the outstanding program feature of a meeting of the Business Development Section, Northwest Electric Light & Power Association in Portland, Ore., May 7-9.

Sponsored by Thomas W. Delzell, association president and board chairman, Portland General Electric Co, the forum brought together Northwest utility executives and security analysts from all parts of the U. S. for a thorough-going review of utility financing problems.

Of the funds to be spent in Washington, Oregon, Idaho, Montana, Utah, and British Columbia, between $395 million and $425 million will be new capital. Analysts warned against taking the easy and apparently cheap way to raise capital through mortgage money as contrasted to equity funds and urged that present conservative security ratios be maintained.

If equity capital cannot be attracted with present earnings, utilities should seek relief from regulatory commissions in the form of higher rates, the analysts insisted. They appealed for more timely and continuous information, more personal contact with managements, and negotiated sales of equity securities rather than competitive bidding.

Delzell said government and private industry can cooperate in providing adequate electric service in the Northwest if a few ambitious people in government would drop their notion of setting up a federal power monopoly which might bring on many of the abuses attributed to utility holding companies. A clear-cut federal power policy would do much toward enabling the private companies to negotiate long-term contracts with the Bonneville Power Administration, he insisted.

Charles A. Parker, president, Central Surveys Inc, noted it was dangerous to conduct opinion surveys among utility employees unless managements were ready to recognize and correct sources of employee dissatisfaction.

In a dynamic business such as the electrical industry it is inevitable that no matter how courageous the predictions of future growth or how spectacular the progress in achieving the goals, the future will always hold out opportunities and potentials beyond the fondest dreams, George C. Tenney, editor, "Electrical West," told the gathering.

Sepa Signs Up Its First Preference Customer

Southeastern Power Administration has signed a contract with its first preference customer, Greenwood County Electric Power Commission.

The Greenwood Commission will receive 5,000 kw from the Clark Hill Dam from which the first power is expected next year. Clark Hill, on the Savannah River, is under construction by the Army Corps of Engineers.

In approving the contract, Secretary of the Interior Oscar L. Chapman announced that he will ask Congress to approve funds for a 41-mile, 115-kv line between Clark Hill and Greenwood. Cost of the line is estimated at $1,172,000.

Sepa will charge the Greenwood Commission 90¢ per kw per month plus an energy charge of 4 mills per kwhr, subject to approval of the Federal Power Commission.

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To Test Constitutionality of Utility Anti-Strike Act

A suit to test the constitutionality of the King-Thompson utility anti-strike law has been filed in the Missouri Supreme Court by the State Board of Mediation.

Attorney General J. E. Taylor has ruled the law unconstitutional and the board, set up to administer it, invalid. The board contends only the courts have power to declare a state law unconstitutional.

Attorneys for employer groups are expected to ask leave to join with the board in defending the act's validity, while labor organizations opposed to the act will join with Taylor in attacking it.

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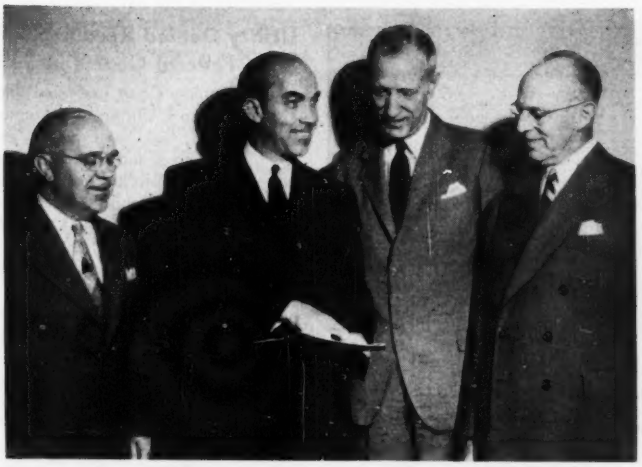
Louisville G&E Planning 600,000-Kw Steam Plant

A 600,000-kw steam generating plant will be built by Louisville Gas & Electric Co near the Ohio River at Cane Run, the company has announced. Estimated cost is $90 million.

The site is on an old stream bed southwest of Louisville, three miles south of the company's Paddy's Run Plant. Generating units will be of 100,000-kw capacity each. First unit is scheduled to go on the line in 1954.



CIVIL DEFENSE for utilities was discussed by NJUA under leadership of these association officers: Sec Howard H. Melvin, left, Millville Electric Light Co; Pres Bayard L. England, Atlantic City Electric Co; V Pres Howard B. Allen, New Jersey Power & Light Co; and Treasurer Walter F. Gray, New Jersey Bell Telephone Co

Coordination of Utilities and State in Civil Defense Planned by NJUA

Plans for cooperation between New Jersey utilities and Civil Defense were crystallized at the spring meeting of New Jersey Utilities Association May 4 at Absecon.

The plans provide that all available utility personnel with necessary equipment be assigned to emergency duties for which they are best fitted and trained in any special functions required. These assignments are to be reviewed periodically, brought up to date, and given "dry runs" if necessary.

Recommendations outlined in a special committee report were adopted by the Board of Directors and submitted to Leonard Dreyfuss, state director of Civil Defense, who attended the sessions.

The report, Dreyfuss said, will be sent by the state to every local Defense Council in New Jersey. He said it was essential for local defense chairmen and utilities to train workers to stick to their jobs in times of emergency so that the utilities can continue to function without interruptions in service.

With regard to wartime disaster, the report stated no utility expects or deems it wise for Civil Defense to train personnel to help repair damaged plants.

The plans also provide for close coordination of work between communication and electric utilities and with state, county, and municipal maintenance forces.

An essential part of the speedy handling of utility emergencies is the two-way radio system some of the companies have installed. For this reason these systems cannot be counted on as a part of the planned Civil Defense network for general use during the emergency, the report pointed out.

Civil Defense organizations, the committee found, can aid utilities during emergencies in the following ways: By moving utility personnel, supplying information, and handling traffic through clearing-up operations, patrol assistance, and demolition work.

The spring meeting included panel sessions on operations during an emergency. Bayard L. England, president, Atlantic City Electric Co, presided. Howard B. Allen, vice president, New Jersey Power & Light Co, was program chairman.

Improved Equipment Cited as Aiding Output

A sound way to increase output and fight inflation is to use improved equipment and techniques that will increase production. This was the keynote of the New Jersey "Modern Methods for Critical Production" Forum held recently at Newark. The keynote speaker was Frank Faron, New York district manager, Apparatus Department, General Electric Co.

Similar forums were held during April at Hoboken, Paterson, Metuchen, Trenton, and Camden. Sponsors were Public Service Electric & Gas Co and General Electric Co. Exhibits at the forums ranged from fluorescent lamps to models of plant load-center power stations and conveyor belts.

D. L. Beeman, manager of GE's Industrial Power Division, pointed out that:

1. An industrial plant power system should be planned as an over-all unit because it functions as an integral unit even though it may be installed in parts.

2. The distribution system generally costs less than 2 to 10% of the building investment and not more than 5% of total plant cost including production machinery.

3. The trend continues toward load center unit substations and use of higher voltages—The 480-v system has about 25 to 50% lower costs and losses than 220-v systems.

Use of electric heat was outlined by E. H. Rusch, GE industrial heating specialist. He cited a 20-kw electronic induction heater that reduced production costs by $2.25 per hour on brazing beater blades for a portable mixer. In dielectric heating of plastics production can be increased as much as 75% and scrap reduced by 50%, he said.

Other speakers discussed industrial lighting, materials handling, and maintenance of machinery and electrical equipment.

•

Plans New Mexico Plant

Public Service Co of New Mexico will start construction on a 20,000-kw steam plant at Albuquerque in October. Cost will be $2,984,000. The plant is expected to be in operation by October, 1952.

YIELDS (%) — Operating Electric Utility Securities

Quality	Bonds 1st	Bonds 2nd	Bonds 3rd	Preferred Stocks 1st	Preferred Stocks 2nd	Preferred Stocks 3rd	Common Stocks 1st	Common Stocks 2nd	Common Stocks 3rd
DATE									
1951									
May 10	2.89	2.94	3.04	3.99	4.26	4.60	5.59	6.32	7.11
May 3	2.87	2.93	3.04	4.02	4.27	4.59	5.60	6.29	7.09
END OF QTR.									
1st 1951	2.87	2.93	3.00	3.96	4.19	4.52	5.47	6.20	7.13
4th 1950	2.65	2.57	2.78	3.86	4.14	4.51	5.80	6.54	7.44
3rd 1950	2.66	2.67	2.76	3.81	4.08	4.46	5.70	6.54	7.25
2nd 1950	2.68	2.66	2.74	3.79	4.03	4.38	5.38	6.51	7.50

Data: Reis & Chandler, Inc.

Florida Electric Utilities Subject to Regulation by State Commission

Electric companies in Florida now are subject to regulation by the Railroad and Utilities Commission. A regulatory act was passed by the legislature and signed by Gov Fuller Warren on May 9. Exempted from the act are municipal systems and Rural Electrification Administration co-ops.

The rate making and regulatory functions in Pinellas County, Tampa, Miami, and other cities will be taken over by the commission.

Under the act public utilities are required to furnish service not involving resales upon request. The law also prescribes that rates and conditions of service shall be fair and reasonable and that no unreasonable discrimination shall be made.

The commission, which up to now has regulated only communications and transportation companies, has power to regulate rates and services of gas and electric firms. The act establishes current rates charged by the utilities as the lawful rates. Rates under litigation are lawful until changed by court or commission order. Rates otherwise may not be changed except by the commission upon request or its own motion. If the commission finds after a hearing that rates are unreasonable, it can order the company to fix fair and reasonable rates. Orders are subject to review by the state supreme court.

Although the jurisdiction of the commission is superior to that of all political bodies, the act provides that the Pinellas Utility Board shall retain jurisdiction over pending rate litigation with the Florida Power Corp.

For rate-making purposes the commission will determine the actual costs of used and useful property and keep a record of net investment. The act specifies no allowable rate of return but provides for rate changes when they are "insufficient to yield reasonable compensation for services rendered."

The commission also has power to prescribe a uniform system of accounts, to require periodic reports, and to require plant additions to provide service. After July 1, 1951, the commission will regulate the issue and sale of securities maturing more than 12 months after date of issue.

The act does not apply to sales at wholesale to municipalities or REA co-ops and does not interfere with rights of municipalities to levy municipal or public service taxes or to receive franchise revenue.

The Florida Senate has passed a bill requiring all carriers and utilities under jurisdiction of the commission to pay the cost of their regulation. The bill has been sent to the House for its consideration.

Utility Denied Recourse to Federal Courts in Suit

The Supreme Court has ruled that Montana-Dakota Utilities Co, Minneapolis, Minn., had "no cause of action" in a damage suit against Northwestern Public Service Co, Huron, S. D. A district court earlier had awarded Montana-Dakota $779,958 in damages on its claim that Northwestern Public Service had charged it fraudulently unreasonable rates.

An appeals court threw the case out on the grounds that the matter should have been taken up with the Federal Power Commission. The Supreme Court held that the FPC did not have jurisdiction but split, 5-4, over whether the company had any means at all of collecting damages. The majority ruled that, even if there were fraud, Montana-Dakota could not get satisfaction from the federal courts.

FINANCIAL BRIEFS

British Columbia Power Commission has been authorized by the provincial legislature to sell its electric systems at Hope and Lillooet to the British Columbia Electric Railway Co. The transfer was proposed after residents claimed they could get cheaper power from B. C. Electric (EW, May 7, p 88). The sales are the first in the six-year history of the power commission. The price is still subject to negotiation with the government.

Power Lines in nine South Dakota towns have been sold by Central Electric & Gas Co, Lincoln, Neb., to West Central Electric Cooperative Association for $850,000. Involved are transmission lines to power plants at Filbert and Myrtle, S. D., and distribution systems in each of the towns.

Electric Utility Financing—May 5-12

Company	Description	Amount of Offering (000)	Offering Price	Yield at Price to Public
Bonds				
Montana-Dakota Utilities	1st mtg, 3.50% serial bonds, new money	$2,000	101.3945%	3.34%
" " "	1st mtg, 3⅛%, 1976 new money	3,000	101.236	3.55
Common Stock				
Atlantic City Electric	117,200 sh new money	2,227	$19.00	6.32
SCHEDULED FOR FOLLOWING WEEK				
Common Stock—Illinois Power, 203,594 sh new money, $7 million.				

Lake Mead Inflow Small; Salt Reservoirs Are Low

The year's inflow to Lake Mead above Hoover Dam in Nevada is expected to be the lowest since 1946, the Bureau of Reclamation estimates. This ties in with reports from hydrologists for Salt River Valley Water Users Association in Arizona that all six reservoirs of their system, with a total capacity of 2,001,715 acre ft, will be dry by September.

Reclamation studies indicate the reservoir above Hoover Dam will rise 22 ft between now and the end of July, reaching a maximum elevation of 1,165 ft. Last year's maximum was 12.5 ft above this level. The April-July inflow is expected to be 6.3 million acre-ft, about 1,181,000 acre-ft less than for the same period last year. This forecast has dropped 1.2 million acre-ft in the last month as a result of subnormal precipitation over the upper Colorado River basin. The average April-July inflow is 9.3 million acre-ft, or 3 million more than is expected this year.

With its reservoirs at a low ebb, the Salt River Valley system's four generating plants on the river, capable of producing 68,000 kw, are generating only 38,000 kw. Lack of stored water will result in a heavier drain on steam- and diesel-generated power to run irrigation pumps for the association, and force larger purchases from outside sources.

Run-off for both the Verde and Salt Rivers is expected to be 290,000 acre-ft, compared with a normal run-off of 600,000. No run-off is expected from last winter's snows on the central Arizona watersheds. Last abundant rainfall in Arizona was ten years ago.

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Flume to Be Rebuilt

United Towns Electric Co, Newfoundland, will rebuild 1,500 ft of the 2,900-ft flume feeding its power station at Seal Cove next month at a cost of $125,000. The existing flume, built 28 years ago, has begun to deteriorate. The plant will be shut down and overhauled during the reconstruction work.

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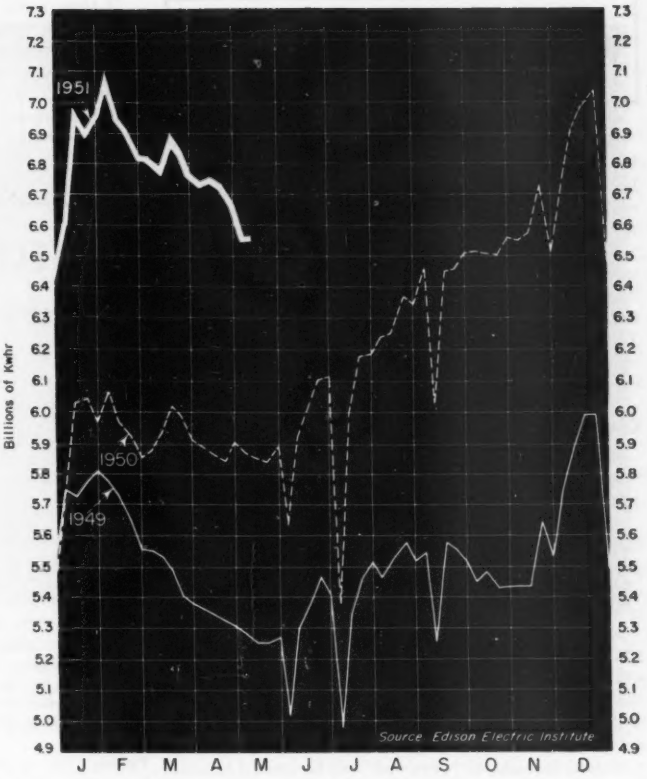
Iowa Franchises Renewed

Iowa Public Service Co has been granted a 25-year renewal of its franchises in Lohrville and Lidderdale.



Output Week Ended May 12—6,566,813,000 Kwhr

Weekly Output, Millions Kwhr			Percent Change from Previous Year			
1951	1950	1949		May 12	May 5	Apr 28
May 12 6,567	May 13 5,864	May 14 5,527	New England	+13.3	+10.1	+11.1
May 5 6,560	May 6 5,868	May 7 5,284	Mid-Atlantic	+12.3	+ 9.5	+10.2
Apr 28 6,674	Apr 29 5,902	Apr 30 5,304	Central Industrial	+13.6	+12.6	+13.7
Apr 21 6,730	Apr 22 5,846	Apr 23 5,326	West Central	+11.0	+ 9.7	+12.4
Apr 14 6,747	Apr 15 5,863	Apr 16 5,343	Southeast	+11.8	+14.4	+14.3
Apr 7 6,736	Apr 8 5,898	Apr 9 5,360	South Central	+13.7	+17.9	+22.4
Mar 31 6,767	Apr 1 5,912	Apr 2 5,378	Rocky Mountain	+ 9.9	+ 8.8	+ 6.7
Mar 24 6,848	Mar 25 5,993	Mar 26 5,404	Pacific Coast	+ 8.9	+ 9.4	+13.2
Mar 17 6,903	Mar 18 6,015	Mar 19 5,496				
Mar 10 6,795	Mar 11 5,937	Mar 12 5,531	Total United States	+12.0	+11.7	+13.1

MEETINGS

Edison Electric Institute
EEI Accident Prevention Committee, Hotel Utah, Salt Lake City, Utah, May 21-22; Electrical Equipment Committee, Hotel Biltmore, Los Angeles, Calif., May 28-29; Annual Convention Shirley Savoy Hotel, Cosmopolitan Hotel, Denver, Colo., June 4-7.

Missouri Association of Public Utilities
Annual Convention, Jefferson Hotel, St. Louis, May 21-23.

Pacific Coast Electrical Association
Annual Convention, Biltmore Hotel, Los Angeles, Calif., May 21-23.

Pennsylvania Electric Association
Prime Mover's Committee, Penn-Belle Hotel, Bellefonte, Pa., May 24-25; Meter Committee, Iram Temple Country Club, Dallas, Pa., May 24-25.

★**New York Meter Engineers Committee**
Hotel Statler, Buffalo, N. Y., June 7-8.

American Society of Mechanical Engineers
Semi-Annual Meeting, Royal York Hotel, Toronto, Canada, June 11-15.

Northwest Electric Light & Power Association
Accounting Section, Boise Hotel, Boise, Idaho, June 14-15.

Canadian Electrical Association
Annual Convention, Algonquin Hotel, St. Andrews, New Brunswick, June 18-21.

American Society for Testing Materials
Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 18-22.

American Institute of Electrical Engineers
Summer General Meeting, Royal York Hotel, Toronto, Canada, June 25-29; Pacic General Meeting, Multnomah Hotel, Portland, Ore., August 20-23.

Pacific Electronic Exhibit
Civic Auditorium, San Francisco, August 22-24.

Illuminating Engineering Society
National Technical Conference, Hotel Shoreham, Washington, D. C., August 26-30.

★ Addition this week

WASHINGTON COMMENT

RONALD D. ROSS

Any way you look at it, a tremendous selling job must be done by the nation's electric utilities—private and public. It's selling the country on power expansion. The stakes are materials for adding millions of kilowatts required in the next few years.

The bite that's needed for power expansion from tight supplies of steel, copper, and aluminum is big, and growing bigger. In January Defense Electric Power Administration found 22.8 million kw on order for the three years 1951-53. Today these schedules are passing 27 million kw. It adds up to more of the scarce metals for plant expansion and equipment.

CMP Won't Solve the Metals Problems

Some utility officials are glibly saying, and believing, that "CMP is the answer." But take a closer look at this new 1951 model CMP, featuring the "open end."

Two different approaches are used in explaining CMP. One is that when all military and essential supporting programs including power are added, there will be copper, aluminum, and steel left on which to run a civilian economy at a reduced level of production. This is unrealistic.

National Production Authority officials who will run CMP expect that the military and supporting programs will "over-subscribe" supplies of these metals. The "open end" will come when authorities in Washington decide that civilian production is to be maintained at a certain level, say as high as 70% of last year's production. When such a decision is made, an "open end" will be created by cutting back military and supporting programs to provide for the civilian production desired.

Electric Power Will Get Less Metal

In this scheme, electric power is likely to take a cut—despite its essentiality for all production. Nor is the threat of material shortages curtailing power expansion an idle one. CMP materials already are being allocated to electric utilities on a "DO" basis by Depa during the second quarter. NPA granted the industry only 85% of the copper Depa sought for the second quarter, 91.4% of the aluminum conductor, and 91.5% of the steel. Even reductions on this comparatively mild scale will, if continued, leave the power expansion program several million kw behind by the December peak in 1953.

One obvious answer to all this is selling the nation on the essential role of power in the mobilization as well as in any civilian production. It's a task for everyone in the power business. Cuts in materials for power will hit all types of power expansion and all electric systems.

A major problem thus far has been leadership. Depa, which ought to be screaming to the nation about the vital need for materials for the power program, has been quietly operating through bureaucratic channels. Even most of Washington is blissfully unaware that there is a defense agency dealing with power, let alone how its program fits into the mobilization picture.

If Depa would take the lead by publicizing the official facts that it has gathered about power requirements and plans for meeting them, the electric utility industry could carry its story to the public—the best way to "reach" Washington officialdom. Unless something is done, and soon, power expansion will be seriously set back by material shortages during the coming months.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Outage of an entire station resulted from unintentional tripping of a generator field breaker while attaching a new nameplate to it.

Clamps of J-bolt design are less likely to cause heating by hysteresis and eddy currents than those of steel U-bolt design; there is thus less limitation on conductor carrying capacity.

Overnight storage of heat could well be explored as a means of making household electric heating economically feasible.

Ultrasonic wave phase shift appears to be a promising way of measuring water velocity (and volume flow) in hydraulic studies.

Austenitic steel expands more than ferritic and has poorer thermal conductivity at low temperatures.

Tubing runs to 90 miles in a million pound per hour boiler for service at 2,000 psi and 1,000 F; that amount of austenitic steel would be costly if dictated by substantially higher temperature.

Insulation testing programs during World War II saved upwards of $60 million worth of strategic electrical equipment for continued functioning.

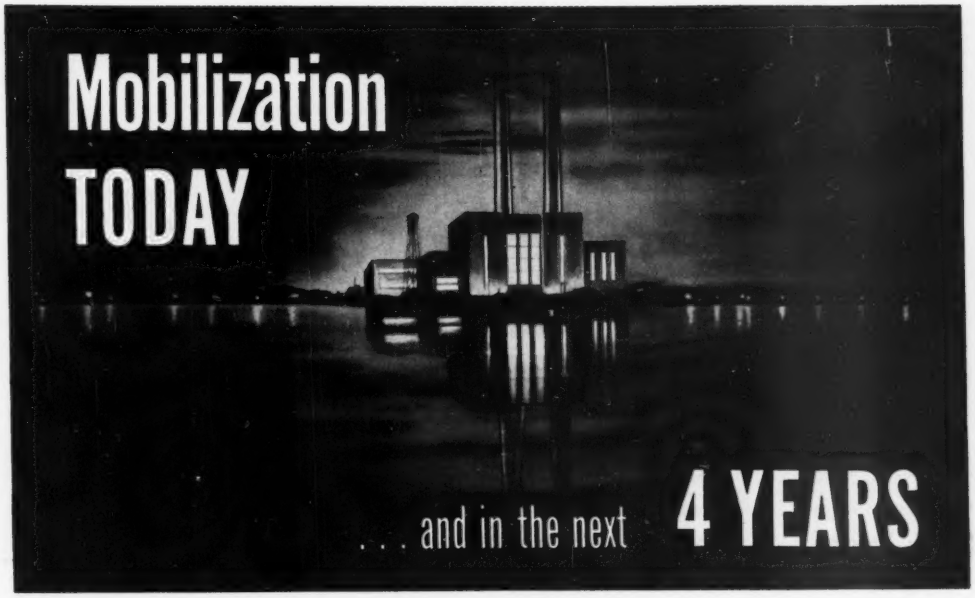
Hydrogen in generator cooling systems is found to leak roughly in proportion to the square root of the gauge pressure; others find linear proportionality.

Pipe-type-cable cost analysis in the Washington area developed $9.57 per kva for 500 Mcm 400-mil low-pressure oil filled, $10 for 600 Mcm medium-pressure gas-filled lead sheath, $9.88 with inner lead and outer neoprene.

Polyethylene does not begin to show creep under long-sustained stress until several times the period for initial creep of lead has elapsed.

Maintenance manhours and costs are found to be least in plants provided with modern machine tools and portable tools (impact wrenches, hoists, etc).

Creep of steel is a case of continuing deformation under constant stress at high temperature and may lead to rupture if the design stress is chosen by the same criteria observed at ordinary temperatures.



America's power requirements for mobilization are now assured providing material and manpower are made available

There is a striking difference between the effect of mobilization on the manufacturing and utility segment of the electrical industry. A survey of 70 utilities shows that business is very much as usual. Of course this statement does not apply to the purchasing agent and the over-worked engineers and executives. But operations have not been seriously disturbed by political and economic changes. Little that is new is being done to improve methods and salvage material.

Utility programs have had to be expanded far beyond earlier plans. The generating capacity scheduled for the next three years is around 27 million kw. Transmission lines and interconnections are being speeded up. On the other hand, shortage of materials and equipment is slowing up the completion of these programs. A loss of 1.5 million kw in generating capacity in the next 12 months is forecast, due to a forced pushback in schedules. Engineering manpower is the other big problem. Practically all companies need engineers now and are concerned about the prospects of a future shortage in view of heavy drafts by the military on college-age men.

It is predicted that over the next five years defense spending will amount to $35 billion in 1951, $55 billion in 1952 and 1953, $50.5 billion in 1954 and $47.5 billion in 1955. During this same period it is estimated that business capital spending in billions will vary beginning with 1951 as follows: $23.8, $25.0, $23.0, $22.0 and $21.0. Certainly there could be no firmer ground for predicting a very substantial growth in the electrical industry than these heavy programs for defense and plant expansion.

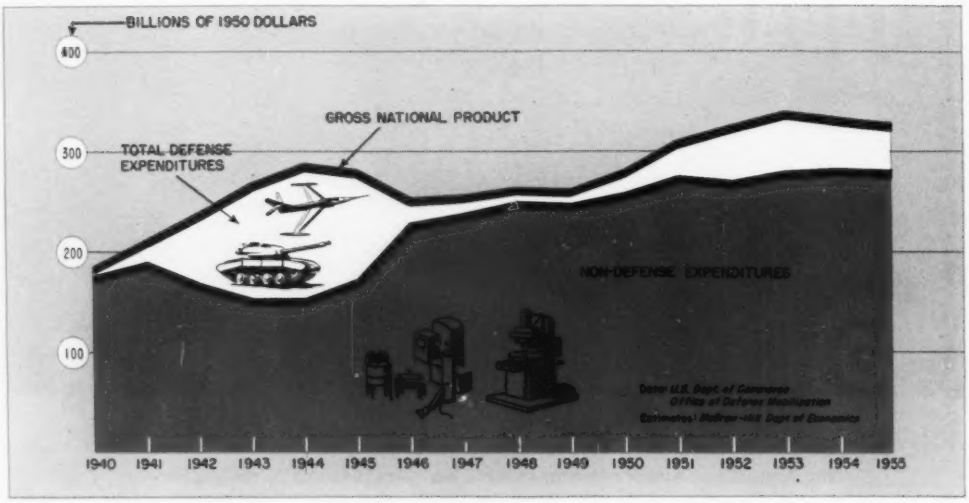
On top of this capital and improvement program, we can expect a high level of consumer income and spending. Population will grow at the rate of at least two million per year. Home construction will be at levels far above historical periods.

From 1950 to 1953, the peak year for the mobilization, total sales of electricity will increase around 35%. This estimate assumes moderate increases in residential, farm, and commercial categories and a 44% gain in large light and power consumption. After 1953 we believe the industrial activity of the country will recede for a few years causing a leveling off of kwh consumption but little loss. In this same period, farm, residential and commercial consumption will receive a new stimulus from availability of consumers goods and home construction.

The industry's plans for adding 27 million kw in the next three years to cover mobilization requirements are nearing completion. The satisfactory accomplishment of this program will depend principally upon the availability of raw material needed to produce the electrical equipment. The manufacturers and utilities are prepared to carry out their part of the program.

The following pages are devoted to a detailed analysis of the industry's position today, forecasts for the mobilization period, and ideas for efficiently providing America's needs for electric power.

The Economic Outlook



HIGHER LEVEL of national output will result from the defense program. And much of the gain is likely to be maintained

Business activity will ride the curve of defense spending. As military requirements mount, in 1951-1953, we will strain to produce everything we can. By 1953 the total value of goods and services produced (gross national product) is likely to reach $340 billion per year.*

There are, of course, limits on our ability to produce; the number of people who can be drawn into the labor force, the hours they will work, and the effectiveness of the average worker. But in an emergency these limits are much more flexible than in normal times. More people will work longer hours, and the total national product can be rapidly increased.

By 1953 we should have 64 million workers in the labor force, 2 million more than in 1951, and 4 million more than in 1950. Overtime has already raised the average work-week to 43.5 hours, from 41.5 last year. And by 1953 it will probably stretch to 44.5.

There is little doubt about the direction of business activity for the remainder of 1951 and well into 1952. Production and prices are headed up. The defense program will give the economy an irresistible push toward higher levels.

But how high will the economic indicators go? And where will they level out—or drop—in 1954 or 1955, when the peak of defense production has been passed?

No one can answer these questions with absolute certainty. The size and duration of our defense effort depends primarily on the unpredictable actions of the Soviet Union. The arms program may be greatly enlarged or cut back, depending on the imminence of a military threat to the free world.

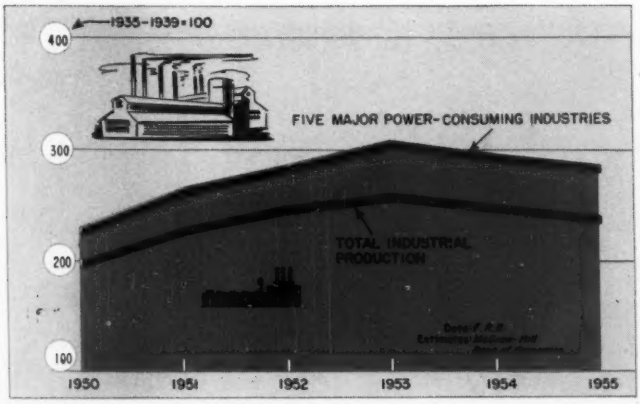
However, the economic implications of a defense effort of the type now in progress are fairly clear. Defense expenditures (chart) are scheduled to rise from about $25 billion a year now to $55 billion or more in 1952 and 1953. This is the budget for rebuilding our armed forces to preparedness strength. After 1953 defense spending is slated to decline gradually. In 1955 it may still be over $45 billion a year.

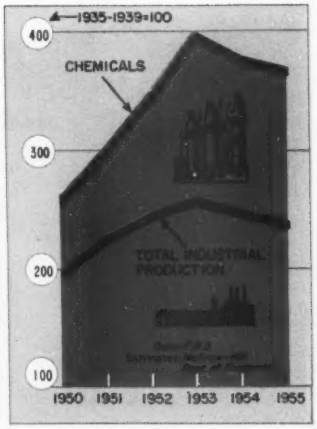
Worker productivity will be up too. Output per man-hour, for the economy as a whole, has risen about 2% per year in the past. So by 1953 it ought to be 6% higher than in 1950. And the bigger labor force can then turn out our $340 billion total of goods and services.

There may be stumbling blocks in the manpower field particularly. It may prove difficult to get workers with the necessary skills or the willingness to work hard for long hours. The $340 billion gross national product is no sure thing. But it indicates roughly the maximum level at which our economy may operate during the emergency.

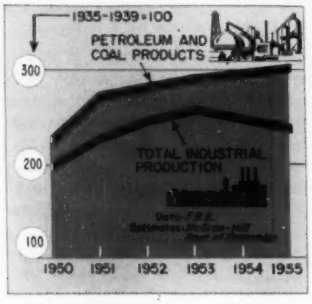
When Spending Declines . . . What will happen to business when defense spending begins to decline? This question is a little easier to answer now than it was during World War

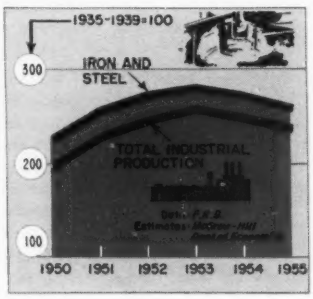
* This estimate is in 1950 prices. Allowing for price inflation, gross national product may be as high as $365 billion in 1953.

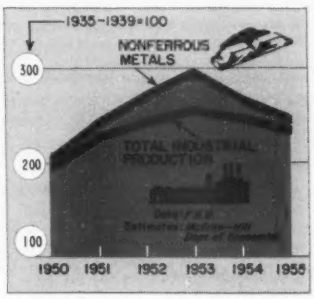




UP A THIRD. Index of production for big power uses rises to 1953 peak







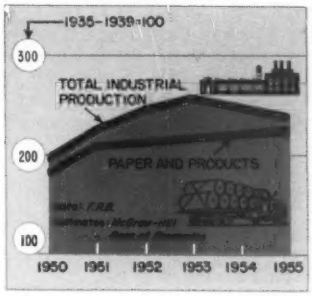
II. Then heavy industry was pretty completely converted to war work, and economists feared that cutbacks in arms production would mean mass unemployment.

This time the arms program, at its peak, will take only about a fifth of our national output. In 1953 we will be producing substantial amounts of civilian goods, even in the metalworking lines. So there won't be the same reconversion problem. Moreover, defense expenditures are slated to remain at a fairly high level. Uncle Sam doesn't intend to demobilize, as in 1945.

The real question is whether there will be enough deferred demand for civilian products to offset the moderate drop in defense spending shown on our chart.

Obviously there won't be as much pent-up demand for automobiles, refrigerators, or factory equipment as there was after World War II, because people will be able to get reasonable amounts of these things during the current emergency. But you can still bet on a fair-sized boom in consumer durables when restrictions are off. At 1953's high income levels, there will be more potential customers than before Korea. And there will also be a strong demand for new housing (p. 122).

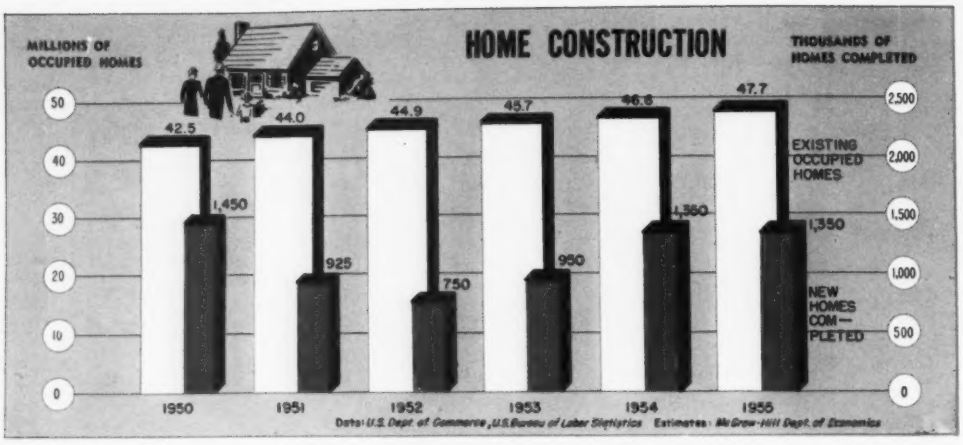
Collapse Unlikely . . . These factors make a business collapse unlikely, unless defense spending is cut more drastically than has been planned. What seems more likely is a slight decline in business activity, as the arms program tapers off. Munitions plants will drop their extra workers,



and there will be less overtime. Under these conditions gross national product might drop to $325 billion in 1955.

This would be a return to normal, high-level business conditions, not a recession of the 1938 or 1949 type. Moreover, it is entirely possible that there will be no decline at all. If sufficient deferred demand for civilian goods exists, we may have a repetition of the 1946 boom. With our enlarged productive capacity, gross national product in 1954-55 could be $340 to $350 billion.

Industrial Production . . . The defense boom is primarily a boom in heavy industry, in the metalworking plants which produce munitions and in the basic raw material



MORE FAMILIES—and splitting up of present households—will mean a large demand for homes, after building cuts are lifted. New building in mid-'50's may come close to last year. And total occupied homes will be up 5 million

lines. Munitions plants particularly have high labor requirements. And heavy industry generally swings in wide cycles. So the upward rush in industrial production—and the later drop, if any—will be more pronounced than for the economy as a whole.

Peak defense production can carry the Federal Reserve index (1935-9=100) from about 225 now (it was 200 for 1950) to 260 in 1953. That's a terrific rise—30% in 3 years. But the new capacity being added by manufacturing companies is enough to do the job, if facilities are used 'round the clock in defense lines.

When defense requirements drop, industrial production will drop with them, perhaps to as low as 240 on the Federal Reserve index. The decline will not be that steep if business generally holds up. But even if business activity continues to expand in 1954-55, there will probably be some decline in the index of industrial production. Defense-related lines—such as aluminum, aircraft, railroad equipment, steel, and heavy chemicals—have a heavy weight in the index.

Five industries lead as consumers of electric power; chemicals, steel, non-ferrous metals, paper, petroleum refinery and coke oven products. This group is headed up slightly faster than industrial production generally (chart). And it probably won't fall off as fast.

The defense program does determine power use in certain fields—steel, aluminum, and atomic energy particularly. But the leading power consumers also include industries with strong independent growth-trends—paper, petroleum, and many chemicals. So the 5-industry group will do better than average over the next four years.

Construction . . . Mobilization has put an end to the greatest residential construction boom in our country's history. Over 1.4 million new homes were completed in 1950. But the 1951 figure will probably be under 950,000. And 1952 will be under 800,000, if present restrictions continue. Commercial construction is slated to drop similarly.

On the other hand, mobilization has brought a rush of industrial building. Business expenditures on new plant and equipment this year will be up a third or more from 1950. And these plant and equipment expenditures will continue at a high level in 1952.

However, for the four-year period 1951-55, you can count on a lot more residential construction—and somewhat less industrial—than indicated by the figures for the early part of mobilization. Remember that by 1953 our national product will be a lot bigger. And restrictions on homebuilding will be relaxed.

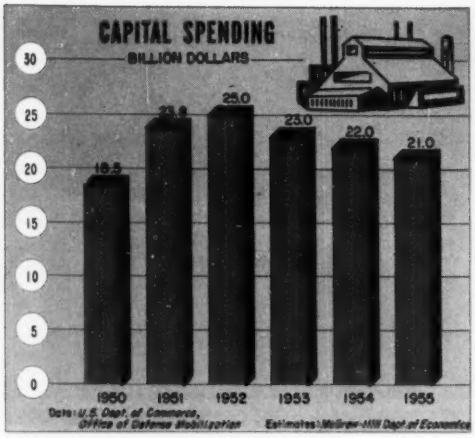
Housing Will Boom . . . When this happens, there's likely to be a housing boom as big, or bigger, than the postwar spree. Here's why:

The number of families in the U. S. is still increasing rapidly. High incomes and the uncertain times are encouraging marriages just as they did during the last war. There are less people in the marriageable age bracket now, because of the low birth rates in the '30s. But population experts still expect an increase of 2.4 million married couples between 1950 and 1955. They also figure on half a million more families headed by women.

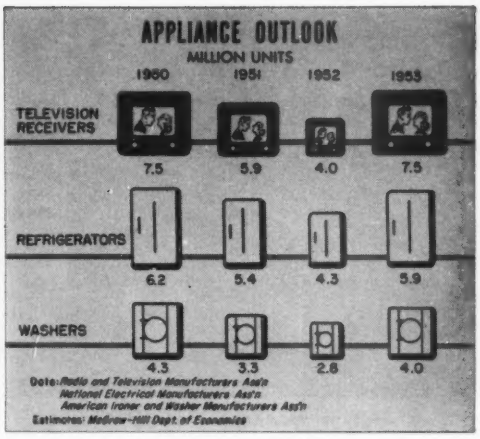
That makes almost 3 million new households by 1955, just on the basis of population growth. But the demand for new housing will be greater than just the increase in families. There are still a lot of families—particularly in the low income groups—living "doubled up".

When more residential construction is permitted—as it will be by 1953—many such families will get their own homes. High incomes generated by defense work will encourage them to do so. And this will also be true of many single persons, or older people, who will get their own apartments instead of staying with the family.

Much of our present housing supply consists of one- and two-bedroom units. These homes will not be satisfactory when couples who married during or after the recent war have second or third children. This is likely to be a frequent case at prevailing high income levels. The bigger families will need bigger homes, leaving the smaller units to single people and newly married couples.



BUSINESS SPENDING on plant and equipment will reach a top in 1952. But high labor costs will keep investment up



APPLIANCE OUTPUT should regain pre-Korea level by 1953. By then, metal supply will be adequate, demand pressing

Not all this shifting around will result in new construction. There will be some houses left vacant and some demolished. But the total increase in households—from new family formation and "undoubling"—should be at least 5 million between 1950 and 1955. That would push up the number of occupied homes from 42.5 million in April 1950 to over 47.5 million sometime in 1955. The average size of a household would drop to 3.3 persons, from 3.4 in 1950.

Deferred demand for housing will accumulate during 1951, 1952, and the early part of 1953. But as restrictions are lifted, we may complete close to a million new homes in 1953, and 1.3 to 1.5 million in 1954 and 1955. The higher figure would provide for some vacancies and demolitions. If restrictions on homebuilding are prolonged, then of course, the new housing boom will be pushed later into the '50s.

Commercial building can be expected to go down, then up, along with housing. Stores, garages, etc., have to be built where there are new homes. Deferred demand here is still very large. We never built enough shopping, parking, or other commercial facilities to match the postwar boom in housing.

Industrial A Question . . . With industrial building, it's a different story. The peak is likely to come late in 1951, since construction of defense plants has to precede tooling up and actual production. Installations of new equipment will continue on a large scale into 1952. But by the middle of next year, plant and equipment expenditures may level off, or even turn down, as they did during the middle stage of World War II.

The post-emergency demand for capital goods is one of the most uncertain factors in the long range business outlook. There won't be the urgency to build new capacity that there is now. Investment in new facilities will depend on taxes and profit possibilities.

Wages Will Stay Up . . . It does seem clear, however, that labor costs are going to stay high. And there will be plenty of opportunities to save labor by modernizing equipment. A lot of old machines will be kept in use during the emergency period.

For these reasons, plant and equipment expenditures are likely to remain above the 1950 level, even when they come down from the 1951-52 peak.

Consumer Markets . . . During the mobilization years, consumer income will increase faster than the supply of consumer goods. Personal income after taxes (disposable income) is likely to rise 5% between 1951 and 1953—even if wages are somewhat controlled and income taxes are boosted as much as $5 billion.

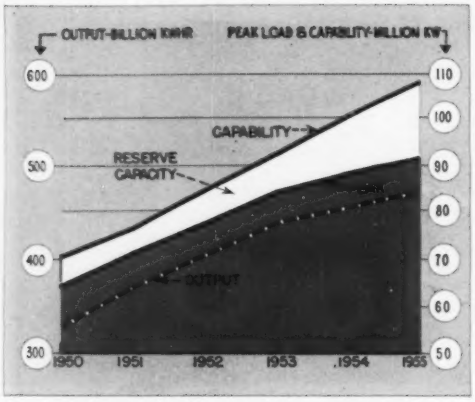
Meanwhile we're cutting down output of consumer durables. "Electrical World" estimates that production of 6 major appliances* will be off at least 15% this year from the 1950 level. About 30% below 1950 is the forecast for '52. People will spend more on soft goods, but not enough more to soak up their increased incomes.

The result will be large savings available after the emergency to buy things like electric appliances. The pent-up demand won't be as great as last time. Taxes are higher now, and we're producing some appliances and other consumer wares right along. But there will certainly be enough consumers (as the above figures on households suggest), and enough money around to buy consumer goods at close to 1950 rates.

There's no sign yet that the defense program will bring about a geographical shift in consumer markets. There's the gradual, continuing migration of people South and West, of course. And this may be hastened a bit by construction of defense plants in these areas.

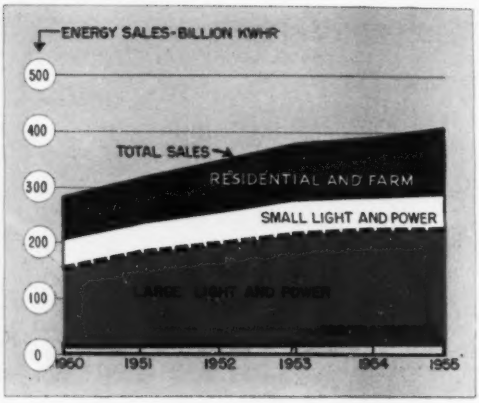
But so far U. S. industry has elected to stay where it is, not make a wholesale shift to the interior to get away from atom bombs. Defense officials think such a move would cost more than it is worth. And without a big industrial shift we won't have huge population shifts either. There won't be a reason for workers to move.

* Refrigerators, ranges, washers, vacuum cleaners, radios, and television sets.



OUTPUT, PEAK AND CAPABILITY
(All Systems)

	Sales (Billion Kwh)	Losses %	Output (Billion Kwh)	LF %	Peak Million Kw	Reserve % of Peak	Capability Million Kw
1950.....	280.5	14.7	329.0	58.4	64.3	9.6	70.5
1951.....	317.9	14.5	372.0	59.5	71.3	8.0	77.0
1952.....	347.5	14.5	406.0	59.5	77.9	11.0	86.5
1953.....	377.6	14.5	440.0	60.0	84.0	15.5	97.0
1954.....	390.0	14.5	457.0	59.0	88.5	17.5	104.0
1955.....	406.0	14.5	475.0	59.0	92.0	20.0	110.4
1960.....	517.0	14.5	605.0	58.0	119.0	20.0	142.8



ENERGY SALES TO ELECTRIC CUSTOMERS
(Billion Kwh)

	Residential & Rural	Small Light & Power	Large Light & Power	Miscellaneous	Total Sales
1950.....	74.4	50.4	139.1	16.6	280.5
1951.....	82.0	54.4	164.5	17.0	317.9
1952.....	90.0	57.5	182.0	18.0	347.5
1953.....	98.0	60.6	200.0	19.0	377.6
1954.....	106.0	64.0	200.0	20.0	390.0
1955.....	115.0	68.0	202.0	21.0	406.0
1960.....	175.0	91.0	226.0	25.0	517.0

MOBILIZATION TODAY AND TOMORROW

Electrical Industry During Mobilization

A 45% growth in sales requiring 53% increase in capacity predicted for next five years. By 1960 85% growth and double the capacity. Adequate reserves predicted by 1953 for most areas

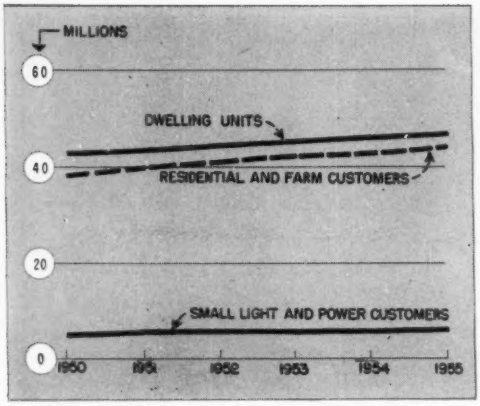
An all out war or peace move would radically change the outlook for most industry. But in the electrical industry firm commitments have been made which are not likely to be changed. Growth would be less with a war economy than now as would be the case if peace was the predominant outlook.

As stated in the preceding section on "The Economic Outlook" we are basing our forecasts on completion of the Mobilization Program. This assumes a quick build-up of production capacity and armaments by 1953. After that a return to a normal including large defense budgets for years to come.

Charles E. Wilson's Report . . . In C. E. Wilson's report to the President "Building America's might," he stated that "with the fullest degree of drive and unity, we can do this job by 1953. By that date our readiness to enter upon total mobilization should be sufficient; and production, in addition to meeting current military needs, should support a civilian economy at or above pre-Korean levels."

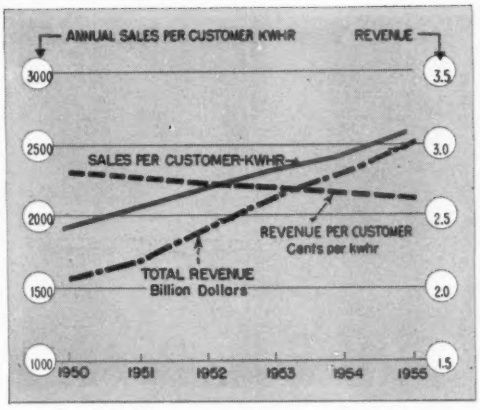
For the electrical industry Wilson estimates that within the next 3 years, electric power capacity needs to be increased by more than 30%—by 22,000,000 kw above the present capacity. His forecast for increased production of electric power is shown in the chart. The significant aspect of this growth trend is the difference between the period 1941 to 1945 and 1950 to 1953.

Although the industrial expansion predominates the thinking of the mobilizers, the civilian purchasing power and buying of consumer goods will be a very important factor in the outlook for the electrical industry. For 1951 they predict that total income will exceed total goods available for consumption by 24%. In the field of electrical consumer durables Wilson shows a production in 1951 of television and radio sets, refrigerators and washers only slightly below that of 1950. This production should therefore be completely absorbed during the year as consumer income rises.



POPULATION, DWELLING UNITS AND CUSTOMERS
(Average for Year-Millions)

	Population	Dwelling Units	Residential & Farm	Small Lt. & Power	Other	Total
1950.....	151.4	42.5	38.2	5.4	0.4	44.0
1951.....	153.4	44.0	40.0	5.6	0.4	46.0
1952.....	155.4	44.9	41.3	5.7	0.4	47.4
1953.....	157.4	45.7	42.4	5.9	0.4	48.7
1954.....	159.4	46.7	43.6	6.0	0.4	50.0
1955.....	161.3	47.7	44.8	6.2	0.4	51.4
1960.....	168.9	51.2	49.1	7.0	0.4	56.5



RESIDENTIAL AND FARM CUSTOMERS, SALES AND REVENUES

	Customers* Millions	Sales Billions Kwh	Sales Per Customer	Revenue Per Kwh-¢	Total Revenue Billion-$
1950.....	38.2	74.4	1940	2.81	2.09
1951.....	40.0	82.0	2050	2.77	2.27
1952.....	41.3	90.0	2180	2.74	2.47
1953.....	42.4	98.0	2320	2.71	2.66
1954.....	43.6	106.0	2430	2.68	2.84
1955.....	44.8	115.0	2570	2.65	3.05
1960.....	49.1	175.0	3560	2.50	4.37

* Average for year

What Happens to Power Use? . . . For 1951 and several years thereafter, there will be a scramble to keep up with load growth. The concensus is that sales will increase 45% by 1955. The biggest gain comes in '51, '52, and '53 as the industrial expansion proceeds at top speed. A 35% increase in 3 years on top of a record breaking 1950. The basis for this growth will be discussed later in this article.

Transforming sales into winter peak demands involves estimates of annual load factors. Since mobilization is a condition far short of war, a 2% increase in load factors is forecast for 1953. Greater improvement would probably be offset by sales of energy in excess of those shown making peak loads stay near the figures given.

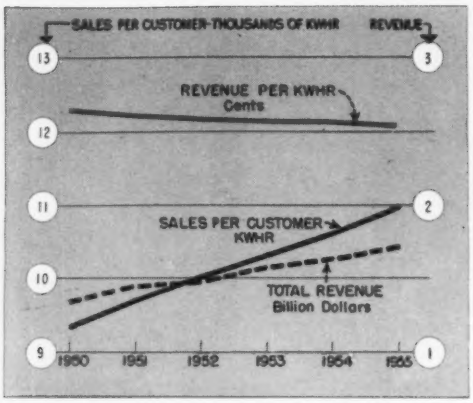
Capability of Power Stations . . . The capability of Class I systems under median hydro conditions was 67.6 million kw at the end of 1950. Adjusting this to include all systems we derive a total capability of 70.5 million kw. This shows a 9.6% reserve over the noncoincident peaks. The concensus is that in the next three years peaks will increase 20 million kw. During this period we are assuming the addition of 26.5 million kw of generating capacity. Thus by 1953 the reserve will be about 15.5%. The industry is not lax in plans, for if they secure the generating capacity now budgeted, 27 million kw would be added by the end of 1953. This would provide a 16.1% reserve which would be entirely adequate from the overall point of view under present circumstances. Material being available, the manufacturing industry could produce this phenomenal capacity requirement.

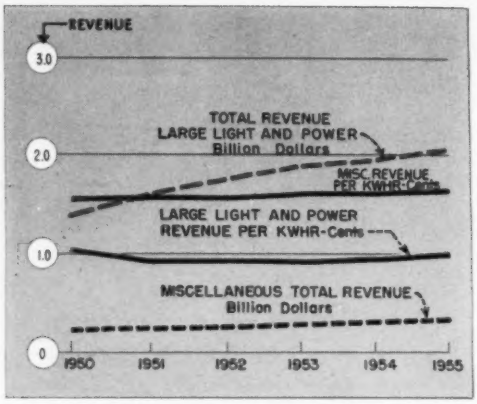
Based upon the industry's own composite estimates in semi-annual surveys, the reserve capacity is planned to average 20% under median hydro conditions. It appears that when deficient areas reach adequate reserves, the 20% allowance might periodically be exceeded. This assumes that among the various areas reserves will range between 15% and 25% depending upon local requirements, interconnections and hydro conditions.

Sales of Electrical Energy . . . Population growth at the rate of at least two million persons per year is a strong stimulant to growth of the electrical systems. Family units, homes and commercial outlets must keep pace with this new trend in population growth. A decade ago forecasters were expecting population growth to drop to very low rates with families decreasing in size. Reversing this trend, in the next five years population will increase by 10 million. Occupied dwelling units will rise 5 million and total residential and farm customers 6½ million. This we believe can and will be accomplished in spite of the Mobilization Program. This increase in customers is still much less than the 9.8 million realized over the past five years which resulted from World War II conditions.

Annual residential and farm sales per customer can be expected to increase from 1,940 kwhr in 1950 to 2,570 kwhr in 1955. As some predict, this could easily be exceeded by 20%. A little setback during 1952 is to be expected due to the limitation on available materials for appliance production. But from 1953 to 1955 we should be back to the 1950 level. It is estimated that total sales in this class will increase on an average of 9 or 10% per year.

Small light and power customers are normally a function





SMALL LIGHT AND POWER CUSTOMERS SALES AND REVENUES

	Customers* Millions	Sales Billions Kwh	Sales Per Customer	Revenue Per Kwh-¢	Revenue Billion-$
1950	5.4	50.4	9330	2.64	1.33
1951	5.6	54.4	9700	2.60	1.41
1952	5.7	57.5	10100	2.58	1.48
1953	5.9	60.6	10300	2.56	1.55
1954	6.0	64.0	10700	2.54	1.63
1955	6.2	68.0	11000	2.52	1.71
1960	7.0	91.0	13000	2.40	2.18

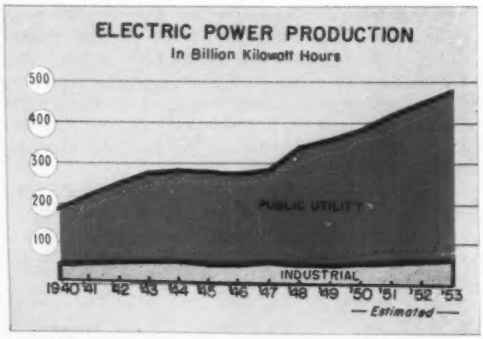
* Average for year

LARGE LIGHT AND POWER AND MISCELLANEOUS SALES AND REVENUE

	Large Light and Power			Miscellaneous		
	Sales Billion Kwh	Revenue Per Kwh-¢	Revenue Billion $	Sales Billion Kwh	Revenue Per Kwh-¢	Revenue Million-$
1950	139.1	1.01	1.40	16.6	1.56	259
1951	164.5	.96	1.58	17.0	1.58	268
1952	182.0	.95	1.73	18.0	1.59	286
1953	200.0	.94	1.88	19.0	1.60	304
1954	200.0	.96	1.92	20.0	1.61	322
1955	202.0	1.00	2.02	21.0	1.62	338
1960	226.0	1.10	2.48	25.0	1.70	425

of population. Whereas in 1950 there were 28.1 people per customer in this class, the trend is toward 26 people per unit in 1955. This gives us an increase in customers of 800,000 in the 5 year period. With an estimated gain from 9,330 kwhr per customer in 1950 to 11,000 in 1955, we reach a total of 68 billion kwhr in 1955.

The close relationship between large light and power sales and the Federal Reserve Index of Industrial Production has been verified by many students of this class of business. At the same time, the increased use of electricity per unit of the index follows a pattern of continued growth as more lighting and electrical facilities are added. It is predicted that the industrial index will average 263 in 1953 compared with 200 for 1950. The resulting gain in sales should be an increase from 139 billion kwhr in 1950 to 200 billion kwhr in 1953. No gain is predicted for 1954 and 1955. The drop in the production index will be offset by an increased kwhr use per unit of the index.



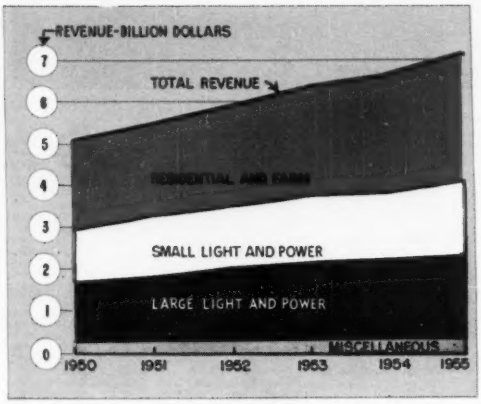
ESTIMATED INCREASE in production of power from 1950 to 1953 is from 385 billion kwhr to 475 billion kwhr or 24%.

Miscellaneous sales of electricity are made up principally of street lighting, other public authorities and transportation. In the future practically all growth is assumed in the street lighting and other public authorities categories.

Revenues from Sale of Electric Power . . . The constant question in the minds of utility management is—will projected sales provide an adequate return on investment? The unknown factors of inflationary trends, taxes and government competition make predictions in this field difficult. But as a means of evaluating the most probable trends we have projected the revenues for the various classes of business.

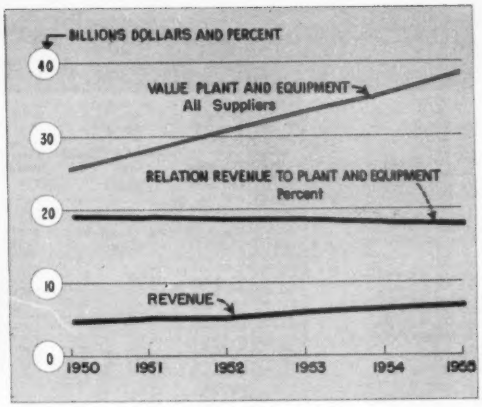
Residential and farm revenue per kwhr is assumed to gain incrementally at 2¢ per kwhr. This provides for some rate increases. The incremental difference between the average bill at 100 kwhr per month of $3.64 and the average bill at 250 kwhr per month of $681 amounts to 2.11¢ per kwhr for cities. It is assumed that increased use will tend to come at lower than average rates.

Small light and power rates seem to be continuing downward but at a slower pace. As was the case during World War II, average rates for industrial customers will decrease as industry increases hours of operation. Such a trend is assumed along with some offsetting effect of some rate increases. Inflationary trends will reflect directly in the



REVENUE FROM SALE OF ELECTRICAL ENERGY
(Billion Dollars)

	Residential & Farm	Small Lt. & Power	Large Lt. & Power	Misc.	Total
1950	$2.09	$1.33	$1.40	$0.26	$5.08
1951	2.27	1.41	1.58	0.27	5.53
1952	2.46	1.48	1.73	0.29	5.96
1953	2.66	1.55	1.88	0.30	6.39
1954	2.84	1.63	1.92	0.32	6.71
1955	3.05	1.71	2.02	0.34	7.12
1960	4.37	2.18	2.48	0.42	9.45



PLANT AND EQUIPMENT VERSUS REVENUE
(Billion Dollars)

	Value of Plant & Equipment*	Revenue	Revenue Percent of Plant & Equipment
1950	$25.7	$5.08	19.8
1951	28.3	5.53	19.5
1952	30.9	5.96	19.3
1953	33.5	6.39	19.1
1954	35.8	6.71	18.8
1955	38.0	7.12	18.7
1960	48.0	9.45	19.7

* Estimates—Includes all power facilities, public & private

energy rates to industrials through fuel clauses. For this reason, we believe that for the long range view rates for this class will gradually increase.

Plant and Equipment Versus Revenue . . . The value of plant and equipment devoted to the production and distribution of electric power for all agencies is estimated to be $25.7 billion by the end of 1950. This compares with $20,565 billion for utility companies estimated for 1950. In 1950 revenue amounted to 19.8% of value of plant and equipment. The estimated growth in plant and equipment with a reasonable allowance for retirements is shown in the accompanying table. Obviously these are rough approximations. Plant increase relates to the increase in capacity. But for the next few years generating plant expenditures will take a larger than normal percentage. After that the distribution system will require heavy expansion. It will be noted that the relationship of revenue to plant and equipment remains relatively stable. This would seem to indicate the likelihood of strength in industry for many years.

Forecasts for 1960 . . . Will the electrical industry suffer a severe decline upon the completion of the mobilization program? Will it return to the prewar doldrums? The experts seem to think just the opposite. A continued dynamic growth seems to be in prospect for a good many years.

For an industry to commit itself to expenditures of over $2 billion each year for plant and equipment to be completed two to four years away required a foresight not needed in many other fields. Executives of utilities along with their supporting system planners carry heavy burdens of weighing the prospects of the future. In the same way electrical manufacturers must evaluate the production capacity requirements far in advance with much heavier fluctuations in prospect than those of the utilities.

The forecasts of fundamental economic trends as shown in these articles along with their reflections in the electrical system are intended to build up the background for individual company predictions. Population, housing, family units, industrial production, and price trends are the tools of the system planners in forecasting system growth. Adjustments for geographical areas are not feasible, but such variations can be more easily accounted for by the individual forecaster.

In viewing these data certain factors should be given special attention. Population is growing with renewal acceleration. Family units and sizes are being expanded at a rate not dreamed of a decade ago. Construction of housing units has received a renewed stimulus and activity is predicted to continue in the post mobilization period at rates double those of pre-World War II.

These new trends conform with those of a dynamic expanding economy. Such can be the prospect if community and national development are constantly promoted under a private enterprise system.

The figures shown in the estimates for 1960 are purely our own. But we believe them to coincide rather closely with those of other forecasters. It can be said that they are near the best guesses available today.

No other industry has such a glowing future to look forward to when this mobilization period becomes history.

New Electric Generating Facilities To Be Installed 1951-54

Compiled by Federal Power Commission as of March 31, 1951

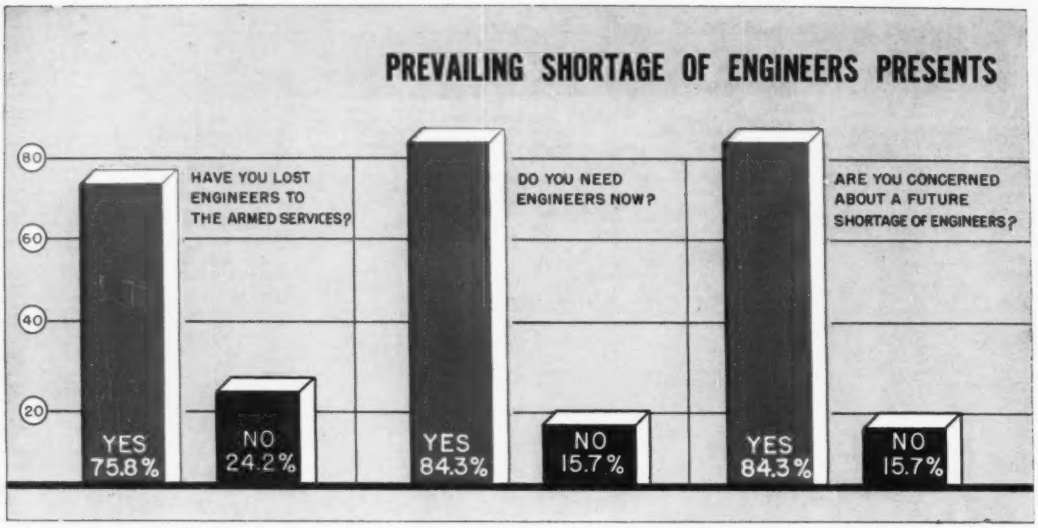
System	Plant & Location	Type	Capacity Kw	To Be Completed
REGION I				
Pangor Hydro-Elec	Graham; Veazie, Maine	GT	6,000	1951
Central Maine Pwr	Mason; Wiscasset, Maine	S	60,000	1952
Central Vt. Public Serv	Weybridge; Otter Cr'k	H	3,000	1951
	Rutland; Rutland Vt.	GT	5,000	1951
	Rutland; Rutland Vt.		10,000	1952
Connecticut Lgt & Pwr	Devon; Devon, Conn.	S	66,000	1951
West Mass. Elec.	West Springfield	S	46,000	1952
Montaup Electric Co.	Somerset; Somerset, Mass.	S	60,000	1951
Fitchburg Gas & Elec.	(Not known)	S	7,125	1951
Holyoke Water Pwr.	Power Plant 3; Conn. R.	H	15,000	1951
New England Power	Salem; Salem, Mass.	S	60,000	1951
	Salem; Salem, Mass.	S	60,000	1952
	Westerly, R. I.	IC	5,000	1951
Boston Edison Co.	Edgar, N. Weymouth	S	81,250	1952
Public Service of N. H.	Schiller; Portsmouth	S	40,000	1952
Taunton, Mass, Munic.	West Water St., Taunton	S	7,500	1951
United Illuminating	English; New Haven, Conn.	S	30,000	1953
Central Hudson Gas & Elec.	Neversink; Grahamville	H	25,000	1952
	Danskammer; Marlboro	S	60,000	1951
Jamestown, N. Y., Munic.	Steele St.; Jamestown	S	20,000	1951
N. Y. State Elec & Gas	Goudy; Binghamton, N. Y.	S	60,000	1951
	Hickling; East Corning	S	40,000	1952
	Unassigned, Dresden	S	80,000	1953
Niagara Mohawk Power	Oswego; Oswego, N. Y.	S	80,000	1951
	Albany; Albany, N. Y.	S	160,000	1952
	Albany; Albany, N. Y.	S	80,000	1953
	Stewart Bridge	H	30,000	1952
	Huntley; Buffalo	S	160,000	1953
Rochester Gas & Elec.	Russell; Rochester, N. Y.	S	50,000	1953
Consolidated Edison	Hudson Gold; Brooklyn	S	60,000	1951
	East River; Manhattan	S	250,000	1951
	East River; Manhattan	S	160,000	1953
	Astoria; Long Island	S	160,000	1952
	Astoria; Long Island	S	160,000	1953
Long Island Lighting	Glenwood 2; Glenwood Ldg	S	99,000	1952
	Far Rockaway	S	99,000	1953
Eastern Shore Pub Service of Maryland	Vienna; Vienna, Md.	S	30,000	1951
Eastern Shore Pub Service of Virginia	Cape Charles	S	5,000	1954
Rockland Light & Power	Hudson; Tomkins Cove	S	22,000	1951
	Hudson; Tomkins Cove	S	66,000	1953
Public Service Elec & Gas of N. J.	Sewaren; Newark, N. J.	S	125,000	1951
	Kearney; Newark, N. J.	S	145,000	1952
	Kearney; Newark, N. J.	S	145,000	1953
Jersey Cent Pwr & Lgt.	South Amboy	S	62,000	1952
Metropolitan Edison	Titus, Reading, Pa.	S	150,000	1951
	Titus; Reading, Pa.	S	75,000	1953
Pennsylvania Electric	Front St.; Erie, Pa.	S	68,000	1952
	Shawville-Clearfield	S	125,000	1953
	Shawville-Clearfield	S	125,000	1954
Scranton Electric	Stanton, Harding, Pa.	S	44,000	1953
Pennsylvania Power & Light	Sunbury; Sunbury, Pa.	S	100,000	1951
	Sunbury; Sunbury, Pa.	S	125,000	1953
Philadelphia Electric	Delaware; Philadelphia	S	125,000	1952
	Delaware; Philadelphia	S	125,000	1953
	Schuylkill; Philadelphia	S	150,000	1954
Delaware Power & Light	Cromby; Phoenixville	S	150,000	1953
	Edgemoor; Wilmington	S	126,000	1951
	Edgemoor, Wilmington	S	75,000	1953
Consolidated Gas Elec Lgt & Pwr Co. of Balt.	Riverside, Baltimore	S	75,000	1951
	Riverside, Baltimore	S	75,000	1953
	Gould St., Baltimore	S	100,000	1952
Potomac Electric Power	Benning; Washington	S	25,000	1952
Pennsy Water & Pwr.	Holtwood; Holtwood	S	66,000	1954
	Total Region I		**4,898,875**	
REGION II				
Duquesne Light	Elrama, Pittsburg, Pa.	S	80,000	1951
	Elrama, Pittsburg, Pa.	S	80,000	1952
	Colfax; Cheswick, Pa.	S	25,000	1953
Monongahela Power	Rivesville, W. Va.	S	74,750	1951
	Albright, W. Va.	S	132,000	1952
Cleveland Electric Illuminating	Lake Shore; Cleveland	S	120,000	1951
	East Lake; Cleveland	S	100,000	1952
	East Lake; Cleveland	S	200,000	1953
Cleveland, Municipal	Lake Road; Cleveland	S	25,000	1952
Columbus & Southern Ohio Electric	Poston; Nelsonville	S	60,000	1952
	Poston; Nelsonville	S	60,000	1953
Ohio Edison	Niles; Niles, Ohio	S	212,000	1953
	Burger; Dilles Bottom	S	135,000	1954
Pennsylvania Power	New Castle; New Castle	S	85,000	1952
Toledo Edison	Acme; Toledo, O.	S	60,000	1951
Ohio Power	Spom; Graham, W. Va.	S	250,000	1951
	Muskingum River	S	351,500	1953
Appalachian Elec. Pwr.	McConnelsville Kanawha; Montgomery, W. Va.	S	175,750	1952
	Kanawha; Montgomery, W. Va.	S	175,750	1953
Indiana & Mich Elect.	Tanners Creek; Lawrenceburg	S	125,000	1951
	Tanners Creek; Lawrenceburg	S	125,000	1952
U. S Corp of Engineers	Philpot; Smith R, Va.	H	14,000	1952
Consumers Power	Whiting; Monroe, Mich.	S	170,000	1952
	Whiting; Monroe, Mich.	S	106,000	1954
Detroit Edison	Connors Creek; Detroit	S	200,000	1951
	St. Clair; St. Clair	S	250,000	1953
	St. Clair; St. Clair	S	125,000	1954
Cincinnati Gas & Elec.	Clermont; Cincinnati	S	100,000	1952
	Clermont; Cincinnati	S	100,000	1953
Dayton Power & Light	Hutchings; Miamisburg	S	60,000	1952
	Hutchings; Miamisburg	S	60,000	1953
	F. M. Tait; Dayton	S	30,000	1951
Indianapolis Power & Light	White River; Centerton	S	40,000	1951
	White River; Centerton	S	60,000	1952
Louisville Gas & Elec.	Paddys Run; Louisville	S	60,000	1952
Public Service Co of Indiana	Edwardsport, Ind.	S	60,000	1951
	Wabash River; Terre Haute	S	90,000	1952
	Wabash River; Terre Haute	S	90,000	1953
So Indiana Gas & Elec.	Ohio River; Evansville	S	20,000	1951
	Total Region II		**4,286,750**	
REGION III				
Virginia Electric & Power Co	Possum Point, Dumfries	S	60,000	1951
	Chesterfield, Richmond	S	90,000	1952
	Gilmerton; Norfolk	S	90,000	1952
	Roanoke Rapids; Roanoke R.	H	91,000	1954
U. S. Corp of Engineers	Buggs Island, Roanoke R.	H	108,000	1952
	Buggs Island; Roanoke R.	H	96,000	1953
Kentucky Utilities Co.	Pinesville; Pinesville	S	30,000	1951
	Tyrone; Tyrone, Ky.	S	60,000	1952
	Green River	S	60,000	1953
Tennessee Valley Authority	Guntersville, Tenn.	H	24,300	1951
	Chickamauga, Tenn.	H	27,000	1951
	Hales Bar, Tenn.	H	48,600	1952
	Pickwick, Tenn.	H	72,000	1952
	Boone; So Holston R.	H	25,000	1952
	Boone; So Holston R.	H	50,000	1953
	Ft. Pat. Henry; So Holston R.	H	18,000	1953
	Ft. Pat. Henry; So Holston R.	H	18,000	1954
	Cherokee; Holston R.	H	30,000	1952
	Cherokee; Holston R.	H	30,000	1954
	Douglas; Ft Broad R.	H	26,000	1954
	Fontana; Little Tenn. R.	H	67,500	1952
	Center Hill; Carney Fork	H	45,000	1951
	Dale Hollow; Obey River	H	18,000	1953
	Wolf Creek; Cumberland R.	H	135,000	1951
	Wolf Creek; Cumberland R.	H	90,000	1952
	Wolf Creek; Cumberland R.	H	45,000	1953
	Cheatham; Cumberland R.	H	24,000	1954
	Old Hickory; Cumberland R.	H	75,000	1954
Tennessee Valley Authority (U. S. Corp of Engineers building)	Johnsonville, Tenn.	S	225,000	1951
	Johnsonville, Tenn.	S	450,000	1952
	Widow's Creek; Bridgeport, Ala	S	450,000	1952
	Widow's Creek; Bridgeport, Ala.	S	225,000	1954
	Shawnee; Paducah, Ky	S	135,000	1952
	Shawnee; Paducah, Ky.	S	405,000	1953
	Swans Pond; Kingston	S	540,000	1953
	Plant B; Colbert, Tenn.	S	270,000	1954
Carolina Power & Light	Goldsboro, N. C.	S	60,000	1951
	Goldsboro, N. C.	S	60,000	1952
	Lumberton, N. C.	S	60,000	1952
Duke Power	W. S. Lee; Greenville, S. C.	S	180,000	1951
	Riverbend; Charlotte, N. C.	S	200,000	1952
	Buck; Spencer, N. C.	S	250,000	1953
So Carolina Elec & Gas	Hagood; Charleston, S. C.	S	40,000	1951
Alabama Power	(Not Known)	S	75,000	1952
	Chickasaw; Mobile, Ala.	S	40,000	1951
	Gorgas; Gorgas, Ala.	S	100,000	1951
	Gorgas; Gorgas, Ala.	S	100,000	1952
Georgia Power	Martin Dam; Tallapoosa R.	H	57,500	1952
	Bartlett Ferry; Chattahoochee R.	H	20,000	1951
	Yates; Whitesburg	S	100,000	1952
	McManus; Brunswick	S	40,000	1952
	Thurman Shoals; Oconee R.	H	45,000	1952
	Not assigned, Oconee R.	H	40,000	1953
Gulf Power	Pensacola; Pensacola	S	30,000	1952
	River Junction	S	40,000	1952
	River Junction	S	40,000	1953
Mississippi Power	Sweatt; Meridian	S	40,000	1951
	Not assigned	S	40,000	1953
U. S. Corps of Engineers	Clark Hill; Savannah R.	H	40,000	1952
	Clark Hill; Savannah R.	H	40,000	1953
	Clark Hill; Savannah R.	H	120,000	1954
Florida Power	Booth Point; Oldsmar	S	40,000	1951
	Booth Point; Oldsmar	S	80,000	1953
	Avon Park, Fla.	S	40,000	1952
	Ellaville, Fla.	S	30,000	1952
Florida Power & Light	Palatka, Fla.	S	28,250	1951
	Not assigned	S	60,000	1952
U. S. Corps of Engineers	Jim Woodruff, Apalachicola R., Fla.	H	10,000	1953
	Jim Woodruff, Apalachicola R., Fla.	H	20,000	1954
	Total Region III		**6,499,250**	

Symbols:
GT – Gas turbine; S – Steam
H – Hydro; IC – Internal combustion

System	Plant & Location	Type	Capacity Kw	To Be Completed
REGION IV				
Wisconsin Electric Pwr	Oak Creek; Oak Creek	S	120,000	1952
	Oak Creek; Oak Creek	S	120,000	1954
Wisconsin Michigan Pwr	Hemlock Falls; Michigamme R.	H	12,400	1952
	Lower Plant; Paint R.	H	100	1952
Wisconsin Power & Light Co	Edgewater; Sheboygan	S	60,000	1951
Wisconsin Pub Service	Bayside; Green Bay	S	62,500	1951
U. S. Corp of Engineers	Salt St. Marie; St. Mary's R., Mich.	H	14,400	1951
Cent Ill Elec & Gas	Sabrooke; Rockford	S	30,000	1952
Commonwealth Edison	Ridgeland; Stickney	S	150,000	1951
	Ridgeland; Stickney	S	300,000	1953
	Will County; Will Co., Ill	S	300,000	1954
	Waukegan; Will Co	S	110,000	1952
	Dixon; Dixon Co., Ill	S	60,000	1953
No Indiana Pub Serv	Michigan City, Ind	S	70,000	1951
Union Electric	Meramec; St. Louis	S	110,000	1952
	Keokuk; St. Louis	S	1,600	1951
Dairyland Power, Coop	Alma; Alma, Wis	S	15,000	1951
	Stoneman; Cassville, Wis	S	34,500	1953
Lake Superior Dist Pwr	Bay Front; Ashland, Wis	S	20,000	1952
Minnesota Power & Light	M. D. Hibbard; Duluth	S	33,000	1951
	Aurora, Minn	S	88,000	1953
	Winslow; Superior, Wis	S	12,450	1952
Mississippi Valley Pub. Serv	Winona; Winona, Minn	S	15,000	1951
Northern States Power	Wilmarth; Mankato, Minn	S	12,500	1951
	Lawrence; Sioux Falls, S. D.	S	20,000	1951
	Black Dog; Minneapolis	S	60,000	1952
	St. Anthony Falls; Minneapolis	H	8,000	1952
	Minn. Valley; Granite Falls	S	40,000	1953
Rural Power Cooperative	Elk River, Minn	S	23,000	1951
Central States Elec Co	Britt; Britt, Iowa	I C	1,150	1951
	Britt; Britt, Iowa	I C	1,150	1952
Corn Belt Power, Cooperative	Humbolt; Humbolt, Iowa	S	11,500	1951
	Humbolt; Humbolt, Iowa	S	15,000	1952
Iowa Power & Light Co	Des Moines Sta 2	S	60,000	1953
Interstate Power Co	Fox Lake, Sherburn, Minn	S	11,500	1951
	Dubuque; Dubuque, Iowa	S	25,000	1952
Iowa Elec Light & Pwr	Prairie Cr'k; Cedar Rapids	S	20,000	1951
	Boone, Iowa	S	15,000	1953
Iowa Public Service Co	Maynard; Waterloo, Iowa	S	20,000	1951
	Carroll; Carroll Iowa	S	5,000	1951
	Kirk; Sioux City, Iowa	S	7,500	1951
	Hawkeye; Storm Lake	S	11,500	1953
Iowa Southern Utilities Co	Bridgeport; Eddyville	S	40,000	1953
Central Illinois Light	R. S. Wallace; Peoria	S	60,000	1952
Central Illinois Public Service	Hutsonville, Ill	S	60,000	1952
	Hutsonville, Ill	S	60,000	1953
Illinois Power Co	Hennepin; (Not given)	S	60,000	1953
	Wood River, Ill	S	90,000	1953
Springfield, Ill, Munic	Lakeside; (Not given)	S	20,000	1952
	Total Region IV		**2,496,950**	
REGION V				
Arkansas Power & Light	Hamilton Moses; Forest City	S	132,000	1951
	Lake Catharine; Hot Springs	S	99,000	1952
Louisiana Power & Light	Nine Mile P't; Westwego	S	66,000	1951
	Nine Mile P't; Westwego	S	99,000	1952
New Orleans Pub Serv	Market St.; New Orleans	S	28,000	1952
Central Louisiana Elec	St. Landry, La	S	20,000	1952
Arkansas Missouri Power	Not assigned	S	30,000	1953
U. S. Corp of Engineers	Bull Shoals; White R	H	160,000	1952
	Bakely Mt.; Quachito R., Ark.	H	75,000	1954
Oklahoma Gas & Elec	Sulphur; location unknown	S	60,000	1952
Public Service Co of Oklahoma	Elk City, Okla	G T	6,000	1951
	Southwestern; Carnegie	S	75,000	1952
Grand River Dam Authority (Oklahoma State owned)	Chouteau; Pryor	S	15,000	1951
	Pensacola; Grand River	H	14,400	1951
U. S. Corp of Engineers	Tenkiller Ferry; Illinois R., Okla.	H	34,000	1953
	Fort Gibson; Grand R., Okla.	H	45,000	1953
Gulf States Utilities	Neches; Beaumont, Texas	S	60,000	1951
	Neches; Beaumont, Texas	S	60,000	1952
	Louisiana St., Baton Rouge	S	15,000	1951
	Louisiana St., Baton Rouge	S	60,000	1953
	Not assigned	S	60,000	1954
Southwestern Pub Serv	East; Amarillo, Tex	S	37,500	1951
	Plant X; Near Amherst	S	50,000	1952
	Plant X; Near Amherst	S	100,000	1953
	Carlsbad, N. M	S	18,750	1952
Texas Power & Light	Gainesville, Tex	G T	5,000	1952
	Lake Creek; Waco, Tex	S	60,000	1953
	Lake Creek; Waco, Tex	S	60,000	1954
Texas Electric Service	Morgan C'k; Colo City	S	44,000	1952
	North Main; Tarrant Co	S	75,000	1952
Dallas Power & Light	Parkdale; East Dallas	S	60,000	1953
Southwestern Gas & Elec	Knox Lee; Longview, Tex	S	30,000	1952
	New plant; Daingerfield	S	40,000	1954
West Texas Utilities	Abilene; Abilene	S	30,000	1953
	Concho; San Anglo	S	30,000	1953
U. S. Corp of Engineers	Whitney; Brazo R., Tex	H	30,000	1952
Austin Texas, Munic	Austin	S	40,000	1951
Central Power & Light	Laredo, Tex	S	30,000	1951
	Victoria, Tex	S	30,000	1952
Houston Lighting & Pwr	Greens Bayou; Houston	S	100,000	1952
	Greens Bayou; Houston	S	100,000	1953
Lower Colorado R. Authority (State of Texas, owned)	Marble Falls	H	30,000	1951
	Granite Shoals	H	45,000	1951
San Antonia, Texas Munic	Leon Creek Plant	S	30,000	1951
	Leon Creek Plant	S	60,000	1953
Internat'l Bo'd'ry Water Comm	Falcon; Rio Grande R., Tex	H	31,500	1953
El Paso Electric	Rio Grande; El Paso	S	30,000	1951
Pub Serv of New Mexico	Person; Albuquerque	S	20,000	1952
	Sante Fe	S	6,000	1951
	Total Region V		**2,436,150**	

System	Plant & Location	Type	Capacity Kw	To Be Completed
REGION VI				
Black Hills Pwr & Lgt	Osage (No location)	S	10,000	1951
Minnkota Power Coop	Woods; Grand Forks, N. D.	S	11,500	1951
U. S. Corp of Engineers	Ft Peck; Mo. River, Mont	H	35,000	1951
Northern States Power	Unassigned	I C	2,760	1953
U. S Corp of Engineers	Ft Randall; Mo. River, S. D.	H	120,000	1954
Nebraska Public Pwr	Harold Kramer; Bellevue	S	30,000	1951
Omaha Public Power Dist	Jones St.; Omaha	S	40,000	1951
Kansas City Pwr & Lgt	Hawthorne; Kansas City	S	132,000	1951
	Hawthorne; Kansas City	S	99,000	1952
St. Joseph Lgt & Pwr Co	Lake Road; St. Joseph	S	20,000	1951
Kansas City, Munic	Quindaro, Kansas City, Ka	S	30,000	1951
Kansas Power & Light	Hutchison, Kan	S	30,000	1951
	Lawrence, Kan	S	30,000	1952
U. S. B. R. (Federal) (Colo. Big Thompson Division)	Boysen; Big Horn R., Wyo	H	15,000	1952
	Alcova; No. Platte Wyo	H	36,000	1954
	Mary Lake; No. Platte Col.	H	8,100	1951
	Pole Hill; No. Platte, Col	H	32,800	1953
	Flat Iron Mt.; No. Platte, Col.	H	63,000	1953
Colorado Spa, Munic	North, Col	S	15,000	1952
	North, Col	S	15,000	1953
Public Service of Colo	Arapahoe; Denver, Col	S	80,000	1951
	Grand Junction, Col	S	7,500	1951
	Lacombe; Denver, Col	S	50,000	1953
Southern Colorado Power	Rocky Ford, Col	S	7,500	1951
Western Colorado Power	Montrose, Col	S	5,000	1952
Kansas Gas & Electric	Murray Gill; Wichita	S	40,000	1952
	Murray Gill; Wichita	S	60,000	1954
	Total Region VI		**1,035,160**	
REGION VII				
Montana Power	Billings, Mont	S	60,000	1951
U. S. B. R. (Federal)	Hungry Horse Dam; Flathead R., Mont.	H	142,500	1952
	Canyon Ferry; Missouri R	H	149,500	1953
Idaho Power	Guffey; Snake River	H	50,000	1953
	Oxbow & others, Snake R	H	30,000	1953
	C. J. Strike; Snake R	H	70,000	1953
	C. J. Strike; Snake R	H	97,500	1951
		H	55,000	1952
Utah Power & Light	Jordon; Salt Lake City	S	60,000	1951
	Jordon; Salt Lake City	S	60,000	1952
U. S. B. R. (Federal)	Anderson Ranch Dam Boise R., So. Fork, Idaho	H	13,500	1951
Pacific Power & Light	Yale, Lewis River, Ore	H	100,000	1952
Portland General Elec	Station M; Clackamas R., Ore.	H	5,000	1951
Washington Power	Cabinet Gorge; Clark Ford R., Idaho	H	150,000	1952
U. S. B. R. (Bonneville)	Grand Coulee; Columbia R	H	324,000	1951
U. S. Corp of Engineers	Albeni Falls; Pendorville R., Idaho	H	28,400	1954
	McNary; Columbia R	H	140,000	1953
	McNary; Columbia R	H	280,000	1954
Seattle, Wash., Munic	Gorge; Skagit River	H	60,000	1951
	Ross; Skagit River	H	270,000	1953
Tacoma Wash., Munic	Cushman 2; Shokemish R	H	270,000	1951
California-Oregon Power	Slide Cr'k; No. Umpqua R	H	18,000	1951
	Soda Springs; No. Umpqua	H	11,000	1951
	Fish Creek; No. Umpqua	H	11,000	1951
	Clearwater; No. Umpqua	H	35,000	1952
	Lemolo; No. Umpqua	H	60,000	1954
	Alturas; Klamath R	H	450	1951
U. S. Corp of Engineers	Detroit; No. Santium R., Ore	H	103,000	1953
	Lookout Point (No location)	H	115,000	1954
	Big Cliff; No. Santium R	H	18,000	1953
	Total Region VII		**2,706,850**	
REGION VIII				
Pacific Gas & Electric	Moss Landing, Cal	S	200,000	1952
	Contra Costa, Cal	S	300,000	1951
	Contra Costa, Cal	S	200,000	1953
	Bear River, Cal	H	29,700	1953
U. S. B. R. (Federal) (Central Valley Proj)	Folsom Dam; Amer. R., Cal.	H	54,000	1954
Burbank Cal., Munic	No name; Burbank, Cal	S	30,000	1952
California Elec. Power	San Bernardo, Cal	S	60,000	1952
Glendale, Cal. Munic	No name; Glendale, Cal	S	20,000	1952
Imperial Irr Dist (Calif.)	Drop 2, All Amer. Canal	H	10,000	1952
	El Centro; All Amer. Canal	S	30,000	1952
Los Angeles, Munic	Owens R. Gorge	H	112,500	1951
	Seal Branch	S	160,000	1953
San Diego Gas & Elec	Silver Gate; San Diego	S	50,000	1952
So Calif Edison	Big Creek 4; San Joaquin R.	H	84,000	1951
	Etiwanda; Fontana	S	200,000	1952
U. S. B. R. (Federal) (Boulder Canyon Proj)	Hoover Dam; Colorado R	H	50,000	1951
	Hoover Dam, Colorado R	H	165,000	1952
U. S. B. R. (Parker, Yuma, Davis, Proj)	Davis Dam; Colorado R., Ariz./Cal	H	180,000	1951
Salt River Project	Kyrene; No location	S	30,000	1952
	Total Region VIII		**1,965,200**	
	Total United States		**26,325,185**	

(Editor's Note: The list of capacity additions, above, was complete as of March 31, 1951. Up until the time of publication 24 of the entries listed as to be completed during 1951 had been placed in commercial operation. The list does not include any additions announced subsequent to that date, according to the Federal Power Commission.)



MOBILIZATION TODAY AND TOMORROW

Plenty of Problems But None

Present conditions are slowing up utility construction programs, but do not

In construction of new plant, electric utilities are laboring under considerable difficulties these days. And very probably their difficulties will increase. But, so far, the conditions of the times have not had impairing effect on operation of utility systems except in a very few instances and then in comparatively small ways.

These broad conclusions are derived from replies of 70 electric utilities in a survey of their problems under the conditions of today. Covered were shortages of manpower and materials and their effects on system expansion programs and on operations. The 70 replies represent about 46% of the industry in terms of generating capacity and of customers served.

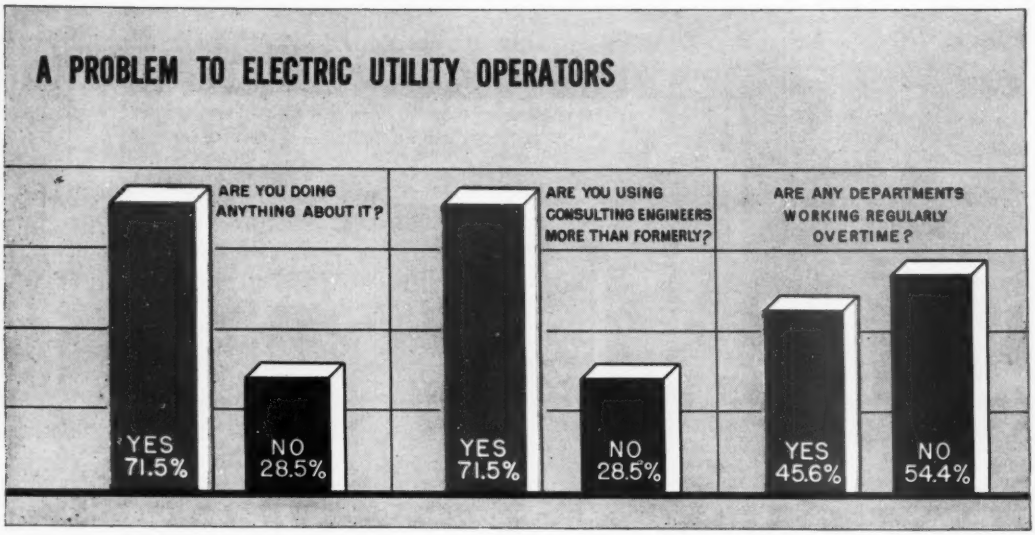
System expansion is being slowed up by difficulty in obtaining materials, principally steel, and by extended delivery times of equipment. An annoying aspect of this situation is an apparent shortage of small parts, hardware, valves and the like. Another brake on construction is a spotty shortage of skilled labor. But the most disturbing factor affecting construction, most disturbing because of its long-term implications, is the shortage of engineering personnel. Loss of engineers to the armed services and to other industry is hindering progress of present construction programs, and the decline in number of engineering graduates dims the outlook for the future.

Engineers Wanted . . . Before the present emergency arose, electric utilities were in need of engineers. Now the need is greater. This is not news. But an idea of how much the need has grown in the past year is afforded by figures from the survey. The 70 replies report some 350 engineers to have entered the armed services, mostly by call-up as reserve officers, from the staffs of the responding utilities. These utilities say they now have need for 684 engineers. Considering 350 of those needed now as replacements for the 350 called up, it appears that the 70 utilities were short 300 or more engineers a year ago.

But this summation of survey replies does not show the complete picture. It is a very uneven one. Some utilities have lost no engineers to the armed services; others have lost many. Of the 70 replies, 17 said that no engineers had been called up. Among the others the number tapped for service ranged from one to as high as 49. This range is not surprising, considering the different sizes of engineering staffs represented in the replies, some very large, others quite small.

In respect to need for engineers 11 replies said that present staffs are adequate. Surprisingly, two of these are from very big utilities. Of the remaining responses indicating present shortages of engineering personnel, five remarked that the condition is not critical.

What's Being Done . . . Concern about the expected shortage of engineers over the next 5 to 10 years is expressed in 59 replies. Of the 11 utilities unconcerned, 6 indicated that established methods of recruitment, in use over past



Yet That Can't Be Solved

significantly affect operations, and service quality is generally well maintained

years, were counted on to supply new men as needed. These methods include the solicitation of college seniors just previous to graduation, and the employment and training of college students during vacations.

Although 59 replies indicate concern about the future supply of engineers, a smaller number, 50, reported anything being done about it. Most of the 50 said simply that greater effort would be made to interest engineering graduates in utility careers. Others indicated efforts to make utility employment more attractive by raising starting salaries—two offer $300 per month—and by reducing routine work as much as possible. This is being done by training qualified men and women as specialized technicians. A high school education is generally adequate preparation for such training. Encouragement of ambitious employees by paying for completed night school and correspondence courses, and participation with local colleges in cooperative programs of work and education were mentioned in some replies. Looking further ahead, 5 replies say that efforts are being made to interest high school students in taking engineering when they go to college. "There is need," says one reply, "for feeding more engineering material at the bottom of the pile."

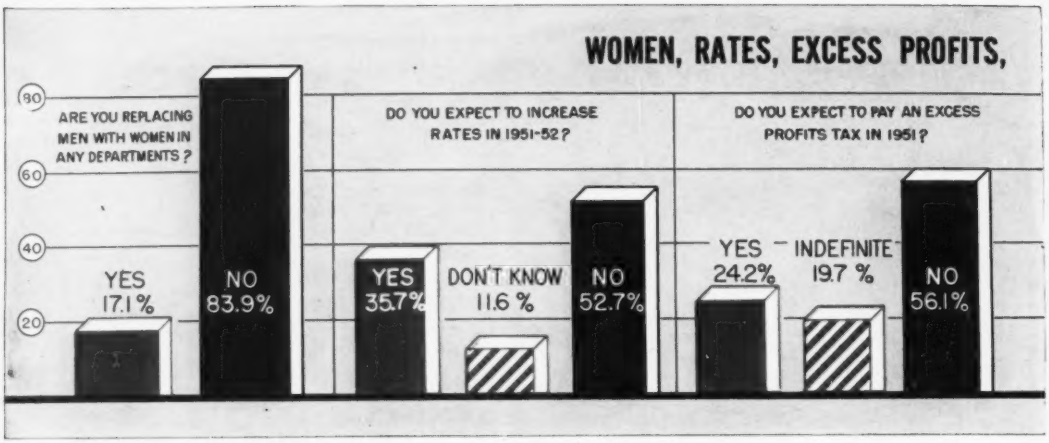
Offer Scholarships . . . Another reply reports the utility working with engineering schools in sponsorship of scholarships offered to students working in vacations. One utility says it makes no distinction between men who are draft-exempt and those who are not in making offers to engineering graduates. The hope is that any who are drafted will want to return when their military service is ended.

Reply from one of the larger utilities says:

"We are impressed with the 'flow back' idea developed by the Scientific Manpower Advisory Committee of the National Security Resources Board and intend to do what we can to further it."

(This committee, headed by Dr. Charles Thomas, of Monsanto Chemical Co, suggested a plan for flow back of certain students to colleges to complete their education. All 18-year-olders would be taken into military service. After 4 months, about 75,000 would be selected to enter colleges and universities, much in the same way as selections are made for officer training. This would provide a continuous flow of men into engineering and scientific education, after which they would be enrolled in a reserve specialist corps and be available for essential military and civilian services.)

The Long View . . . The general tenor of replies indicates that most of the concern over shortage of engineers looks to the immediate future—this year, next year, and the year after—rather than to the long term. Most replies speak only of greater effort to interest engineering graduates. Only a very few refer to the decreasing number of students entering engineering courses. Here, apparently is a symptom of the general illness of our times—most people trying to get bigger shares of what there is, instead of



working to increase the total supply.

Greater use of services of consulting engineers than in the past two years is now being made by 20 of the 70 reporting utilities. In several cases this is caused by new power plant and other construction for which consultants are normally employed. But mostly the reason appears to be lack of engineering manpower to handle urgent expansion programs.

Working Overtime . . . Regularly scheduled overtime work is reported by 32 replies; no overtime except in emergencies by 38. Overtime in the engineering department is noted 13 times in the replies; overhead lines, 10 times; operating, 6 times; construction, 4 times; service, 4 times; accounting, 3 times; drafting, 3 times; underground lines, once; purchasing, once. All departments working overtime is reported in 4 replies.

Of replies reporting amounts of overtime, the greater number note a nine-hour five-day week in the departments affected. Several indicate an eight-hour six-day week, and a few half-day work on Saturday.

Causes for Longer Hours . . . Overtime in engineering, drafting, and construction departments is directly attributed to speeding up of system expansion in most cases. In overhead line work, particularly on widespread systems, the cause of overtime appears less the necessity for speed in getting work done than the straight economies of a nine-hour versus an eight-hour day. The proportion of unproductive travel time is reduced by the longer work day. Overtime in operating departments, accounting included, seems to be the result of lack of personnel trained and experienced in specialized work. The one reference to overtime in the purchasing department says it is caused by work required "to interpret and clarify the meaning of government control regulations." It is, of course, apparent that all the particular reasons for overtime in different departments stem back to the single reason of faster post-war growth in load and in number of customers than the industry was prepared, in terms of qualified personnel, to handle easily and without some strain. Now that another emergency impends, the condition is aggravated.

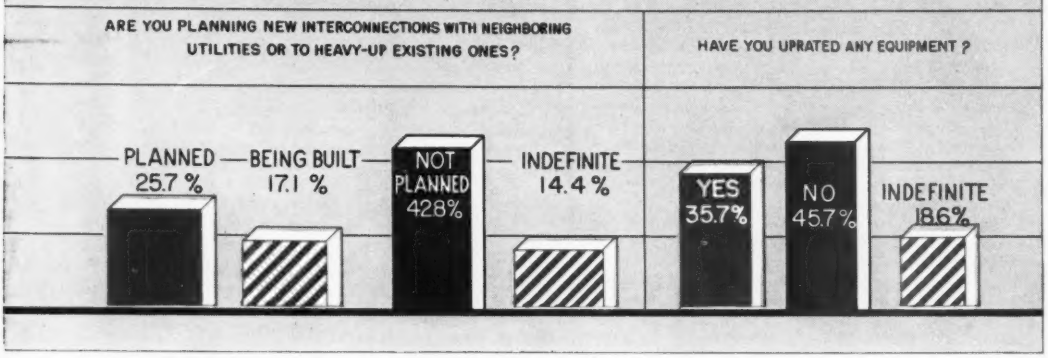
Replacement of men by women has not gone very far in the industry as yet. Only 12 of the replies report such replacement and these only in a small way. One says girls instead of boys are being hired for mail and messenger service. Another says that regulations in regard to keeping women employees after marriage have been relaxed. A third reports offer of employment to two girls who will graduate this June with degrees of BS in mathematics. Work for which women are being hired includes clerical, accounting, meter reading, inside meter testing, and drafting.

Not Many Rate Increases . . . Less than one third of the utilities covered in the survey reported that they expected to increase rates in 1951-1952, or had done so since the beginning of the year, 25 out of 70. Over half, 37, said they did not expect to increase rates this year or next. The remaining 8 did not reply to the question or said they did not know. Among those in the "no" and "don't know" groups, replies were frequently qualified by references to higher taxes and rising costs of money, labor, equipment and materials which might easily cause change in viewpoint.

Some utilities felt they were adequately protected against presently rising costs by fuel clauses and by automatic adjustments according to specified economic indexes included in rate schedules.

An interesting comment on rate increases came from one utility. Increases are not being considered in the residential and commercial customer classes. But industrial rates were set some years ago on a competitive basis, low enough to prevent industrials from installing their own generating plants and high enough to contribute reasonably to utility net revenue. This situation has changed. Rising costs have greatly reduced the contribution of income from industrial customers to net revenue. Also they have increased the investment the industrial customer would have to make to supply his own power. Thus there is room for a significant rise in the industrial rate level before the competitive limit is reached.

INTERCONNECTIONS, AND LOADINGS


ARE YOU PLANNING NEW INTERCONNECTIONS WITH NEIGHBORING UTILITIES OR TO HEAVY-UP EXISTING ONES?
PLANNED 25.7 %
BEING BUILT 17.1 %
NOT PLANNED 428%
INDEFINITE 14.4 %
HAVE YOU UPRATED ANY EQUIPMENT ?
YES 35.7%
NO 45.7 %
INDEFINITE 18.6%

Few of the replies stated the amounts of rate increases granted or desired. Rises of 14% (one reply), 12% (2 replies), 11% (2 replies), 10% (5 replies), 9% (one reply), 5% (3 replies) and 2% (one reply) were mentioned.

Few Subject to EPT . . . Excess profits taxes apparently will not bear down generally on electric utilities. Of the 70 utilities replying, only 16 said they expected they'd have to pay the tax in 1951; 37 said they did not expect to; 13 said they did not know yet; and 4 were municipal and federal systems to whom the tax does not apply.

Estimates of excess profits taxes in ratio to normal income taxes range from 4% to 10%. These are much in the nature of guesses, many of them qualified by references to business conditions as affecting revenues and to tax laws and interpretations of them.

Fuel Costs . . . Figures on increase in price of coal since June, 1950, were given in 31 replies, of oil in 37, and of gas in 3. Range of coal price increases reported is from —17¢ to 70¢ per ton. (Only 2 replies showed negative increases—17¢ and—4¢). Average of the 31 replies is 30.1¢ per ton and the median in the range is 25¢, 18 of the replies falling below the average.

Range of oil price increases is from 2¢ to 95¢ per bbl of 42 gal. The average is 34.9¢ and the median 38.2¢. Below the average lie 18 replies. The 3 figures on increases in gas prices are 1¢, 2.5¢ and 3.89¢ per Mcu ft.

Ways to Save . . . Deferment of construction not considered essential received more frequent specific mention in the replies than any other ways to conserve manpower, material, and money in programs of system expansion. Next came outdoor design of power plants and substations. Almost all the replies spoke in general terms of a continuing trend towards automatic operations—unattended substations, supervisory control and the like—and many simply reported that measures of economy developed during World War II had not been relaxed. Substitution of wood for steel in transmission and substation structures and steel frame for concrete in a hydro power plant are mentioned.

Greater use of mechanized equipment on line and other construction, 2-way radio for line crews, higher distribution voltage, unit design and largest possible sizes of generating capacity, "packaged" substations, 3-phase transformers instead of banks of single phase, survey of system equipment to discover any idle or underloaded apparatus are among the ways reported in the effort to get the most from existing and new facilities.

Construction Labor . . . Of the 70 replies, 22 report no particular problems as yet in respect to manpower for construction. This is not to say that the remaining 48 utilities do have such problems. Many of their replies were unresponsive on this point. Among the difficulties and problems mentioned were shortages of skilled labor and of apprentices in trades, and competition with local industries for skilled men. Several replies told of contracting construction because of inability to obtain workers.

Only 4 replies reported use of premium pay to attract labor, and 4 more said that unions were demanding a 48-hour week, which amounts to premium, since 8 hours are overtime. No premium pay was noted in 30 replies, and the remaining 32 were unresponsive.

Procurement Difficulties . . . Deliveries of material and equipment are not bad yet, said 20 replies and 27 said they were slow. Structural steel seems to be the most troublesome item in the delivery picture. Although often delayed, deliveries of large equipment seem to be coming through without causing much trouble. More difficulty is being had with small stuff—piping, valves, and miscellaneous hardware. Confusion in respect to government orders is instanced by 2 replies as the major cause of trouble in obtaining materials. Distribution transformers and poles are mentioned several times as in short supply. A note of "comfort in adversity" appears in one reply which remarks that delivery delays are easing the labor shortage.

New interconnections with neighboring utilities or heavying up of existing ones are reported as planned in 18 replies and as being built in 12. Of the remaining 40, 30 report no plans and 10 are indefinite as to plans or are un-

What One Utility Is Doing to Conserve Manpower, Materials And Money in Provision of New System Facilities

Power station construction costs are held down by strictly unit design in largest practicable components; by design which takes advantage of production capability, not nominal rating, of equipment; by putting stack and draft and dust equipment at ground level, thus reducing structure loading; by omission of building enclosure wherever practicable; by allowance of minimum yard area above flood stage, additional area to be provided by ash fill-in; by omission of auxiliary equipment not wholly essential; by use of 3-phase output transformer instead of bank of single phase.

Major economy in transmission is being obtained by the use of much higher capacity circuits, thereby reducing the number required.

Costs of, and materials required for, distribution are reduced by inserting new substations midway between existing ones. The same idea is used to reduce subtransmission expense by such location of large step-down stations as will result in reduced mileage of these circuits. Also, savings are made by use of "packaged" substations and by omission of high-voltage switching in substations.

responsive. In many of the "no" replies references are made to existing interconnections which are considered to be adequate for any loads that may be put on them.

In a couple of replies reference was made to the "delicate" matter of interstate ties between systems. Transcending this in "delicacy" is the proposal for a new inter-nation tie between the Detroit Edison and the Ontario Hydro-Electric systems with its obvious economic advantages to both. Off-peak thermal energy from Detroit would conserve water for the hydro system in dry periods and plentiful water in Canada would save fuel in Detroit.

Small Margin for Uprating . . . Although an accompanying graph shows 25 replies reporting uprating of equipment it is questionable whether so large a proportion of the utilities represented in the survey have done so as a result of recent conditions. Operation of generating equipment at capability, rather than nameplate, ratings has become quite the general practice. So also has the loading of transformers, cables and other facilities on a thermal basis. In the years since World War II, few, if any, utilities have been so happily situated in respect to capacity from power plant to customer that they could forget the lessons of the war period. Thus there remains today little or no margin for further uprating of equipment.

Salvage Operations . . . Of the 70 replies on this subject, one stands out from all the rest. It says that salvage operations are being reduced—the reason, increased labor cost. Perhaps, though, this is not such a standout after all, because 52 replies reported no change in salvage practices. More items included in salvage programs was reported in 10 replies and more attention given to such operations in 5. Several of these 15 mentioned enlargement of programs to take in items whose salvage value is doubtful. One reply said salvage procedures were being re-checked and another that materials and equipment were being kept in use longer.

It is apparent from the replies that the extent of salvage operations is widely variant among utilities, the larger ones doing much more than the smaller. This is quite logical because salvage is justified economically by quantity of materials and equipment concerned.

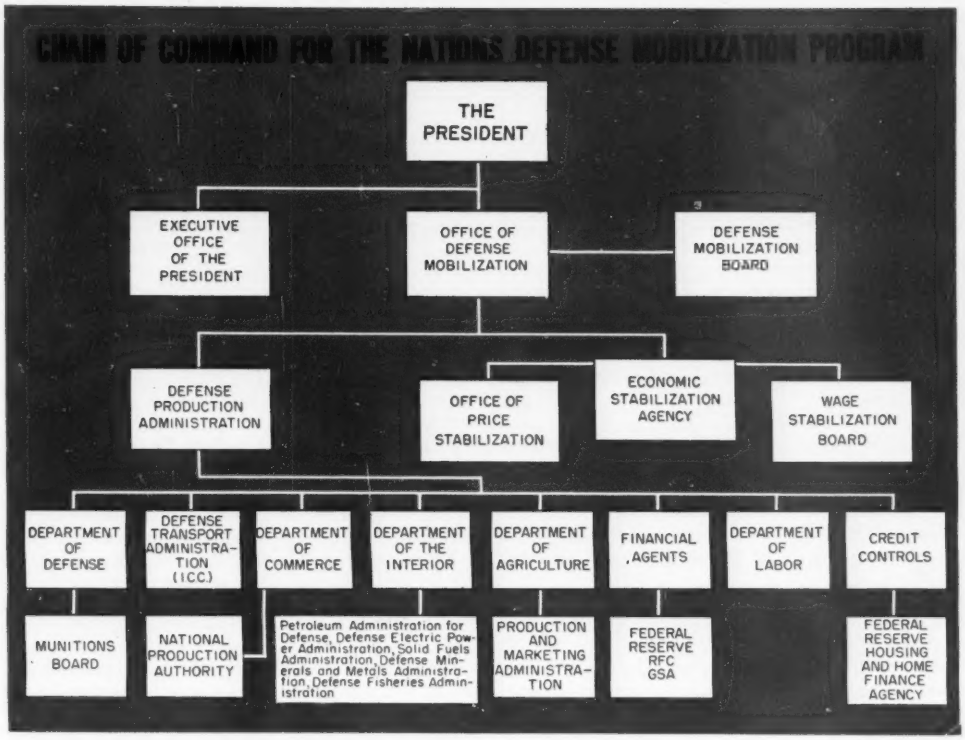
Line Loading . . . No particular measures are being taken to increase load-carrying ability of lines, say 63 replies. Lines already loaded to capacity are reported by 6 of these and the same condition is indicated by several others. Installation of capacitors and regulators to raise line loadings is reported by 6 and one says distribution voltage is being raised.

Voltage Fluctuations . . . So far, there has been comparatively little impairment of service quality in regard to maintenance of voltage within customary limits. Only 8 of the 70 replies say or indicate that the allowable limits of voltage fluctuation have been widened. These have been forced by difficulties hindering the taking of corrective measures as loads have grown. One utility has set up 3 classes of voltage range, preferred, tolerable, and emergency. Presumably the cases in the third class get quickest attention. Many of the replies contained notations that close watch was being kept on voltage fluctuations, evidencing that most utilities are concerned about the situation and are doing what they can to forestall any deterioration of voltage quality.

Tree Trimming and Clearing . . . Reduction in amount of tree trimming and clearing right-of-way is reported in 6 replies; 4 saying this work is being held to the minimum, one that it has been cut 50%, and one that it is lagging. Of the remaining 64 indicating no relaxation of this work, 4 report it is being increased. Contract tree trimming is mentioned in 11 replies, but probably this does not accurately represent the extent to which this work is done by outside firms. Chemical control of right-of-way is noted 8 times, but here again the figure is probably not representative. General impression from the replies is that present conditions have had little effect on established practices in this line.

Maintenance Materials . . . Shortages have not yet had much effect on maintenance operations. But there is apparent in the replies a general inclination to keep the fingers crossed. Several replies mentioned closer watch on possibilities of salvaged items for maintenance. One utility reports study of maintenance schedules in the idea of lengthening periods. Improvising and use of substitute materials are mentioned. The only maintenance item mentioned more than once as being short is electronic tubes. This is noted 6 times in the 70 replies. No trouble or only small difficulty is reported in 62 replies. So far, the maintenance picture does not look too bad.

Inventories . . . The "as yet" feeling is strongly apparent in replies on shortages. No shortages are reported in 34 replies, most of them with such qualification. Of specific items short copper leads with mentions in 23 replies. Next come poles, mentioned 13 times. Following come line hardware, 9 times; distribution transformers, 7 times; insulators, 5 times; steel, 5 times; aluminum, 4 times; crossarms, 4 times; lead covered cable, 3 times; electronic tubes, 3 times; power transformers, 2 times; and connectors, boiler tubes, pipe, and valves each once.


CHAIN OF COMMAND FOR THE NATIONS DEFENSE MOBILIZATION PROGRAM
THE PRESIDENT
EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF DEFENSE MOBILIZATION
DEFENSE MOBILIZATION BOARD
DEFENSE PRODUCTION ADMINISTRATION
OFFICE OF PRICE STABILIZATION
ECONOMIC STABILIZATION AGENCY
WAGE STABILIZATION BOARD
DEPARTMENT OF DEFENSE
DEFENSE TRANSPORT ADMINISTRATION (ICC)
DEPARTMENT OF COMMERCE
DEPARTMENT OF THE INTERIOR
DEPARTMENT OF AGRICULTURE
FINANCIAL AGENTS
DEPARTMENT OF LABOR
CREDIT CONTROLS
MUNITIONS BOARD
NATIONAL PRODUCTION AUTHORITY
Petroleum Administration for Defense, Defense Electric Power Administration, Solid Fuels Administration, Defense Minerals and Metals Administration, Defense Fisheries Administration
PRODUCTION AND MARKETING ADMINISTRATION
FEDERAL RESERVE RFC GSA
FEDERAL RESERVE HOUSING AND HOME FINANCE AGENCY

MOBILIZATION TODAY AND TOMORROW

Controls on Industry Have Been Light

The need for materials indicates regulations will last a long time

THOUGH the electrical industry has been touched relatively lightly by industry mobilization controls, it may be under them longer than most other industries. Controls over the electrical industry will not be lifted until there is every assurance that:

1. Essential industries can get all the power they want where they want it.

2. Manufacturers of equipment essential to electric utilities can get sufficient materials to keep their production lines moving.

This can mean controls until 1956 though it is believed that most other industries can be free of them late in 1953. The trouble is that power suppliers now have placed enough orders to keep manufacturers of heavy equipment busy through 1954. But materials shortages will delay deliveries a year or more. Strikes, natural disasters, fires, etc, can cause more delays. But power suppliers are still blueprinting more plants and ordering more equipment. This can go on for years.

There are five reasons for the industry's good fortune:

1. The electric utility industry is essential. Any action which hampers the industry automatically hampers the nation's rearmament—the main purpose of the controls organization—as well as interrupts the nation's progress to a higher standard of living.

2. There is just a "handful" of power suppliers. All are used to working together in power pools and trade associations. Thus the industry is used to co-operating.

3. Electric utilities are accustomed to being regulated by federal and state authorities; so they understand the "bureaucratic mind" better than industries to whom controls are only a "wartime" occurrence.

4. The industry didn't wait until the Korean hostilities to begin planning. At that time it had a construction program outlined for the next three years.

5. The manufacturers of heavy apparatus are relatively

few. They had made plans to operate at peak capacity to supply the equipment for the utilities' new plants.

So Far . . . the industry's one big problem has been materials. Steel, especially alloy steels, has been in tight supply. Non-ferrous metals—aluminum, copper, lead, tin, zinc—have posed even more difficult problems.

It has been materials that have been keeping busy the two government control agencies most affecting the industry. These are the National Production Authority and the Defense Electric Power Administration.

NPA, which is under the Department of Commerce, is charged with insuring that rearmament requirements for production materials and facilities are met on schedule, that productive capacity and production and supply of materials and facilities are expanded, and that after defense needs have been met supplies of critical materials and products remaining be distributed equitably for non-defense uses.

NPA's Power Equipment Division has been handling these responsibilities for the heavy electrical apparatus industry and indirectly for the utilities. Last month in a reorganization of NPA's industry divisions PED was split into an Engine and Turbine Division and an Electrical Equipment Division. The former has responsibility for most equipment up to the busbar. The latter carries on from there.

NPA . . . has been controlling materials through a series of Material Orders (M-Orders). These control a large number of materials (metals, chemicals, rubber, wool, paper, etc) as to purchases, inventories, disposal of scrap, and end use. Orders are amended as changing conditions necessitate.

Utilities and electrical manufacturers have been aided in getting materials through the use of Defense Orders (DO's). In certain cases they have been granted directives. These are super-DO's which order a supplier of materials, parts, or equipment to fill one specific order of the person or company.

As of July 1 a Controlled Materials Plan, very similar in operation to the CMP of the last war, will govern the use of aluminum, copper, and steel. CMP will allocate to essential users all of these metals that NPA determines that they need. All supplies of these metals remaining will go in a pool for non-essential users.

The electrical industry will gain by the establishment of CMP. In the past manufacturers and utilities have been granted Defense Orders (DO's). But these only gave their holders the right to buy materials if they were available. Frequently they were not because suppliers were forced to accept DO's only up to a certain percentage of their output, usually around 35%. The remainder could be sold in the open market. Manufacturers and utilities have had to scramble to secure materials. CMP will put an end to this. Furthermore, both will find it easy to swing into CMP. They were programmed for CMP materials when CMP was made law.

The industry's one big fear of CMP is its "open end." The present plan is to give manufacturers of equipment essential to the defense program and civilian life first call on the scarce metals. What is left will be available to non-essential users. The trouble is that after essential users have asked for their allotments nothing will be left for the "pool." Then somebody in Washington, perhaps the President, will decide that the essential users must be cut back. Since relatively the power industry is in far better shape than other essential industries, it is a certainty that the power industry will have to do with less CMP material. This will slow the industry's construction program and could cause difficulties later.

Depa (originally the Defense Power Administration) has the job of seeing that the nation has all the power it needs where it is wanted. So far it has been lucky. It has not had to rule on the relative essentiality of any plant. This is due to the extensive construction programs of power suppliers, both public and private. Only the Atomic Energy Commission has needed unusually large amounts of power.

Depa is operating under the Department of Interior. This has caused some unhappiness to the private companies because Interior Secretary Oscar L. Chapman, the "big boss" of federal power, can and has overruled Depa.

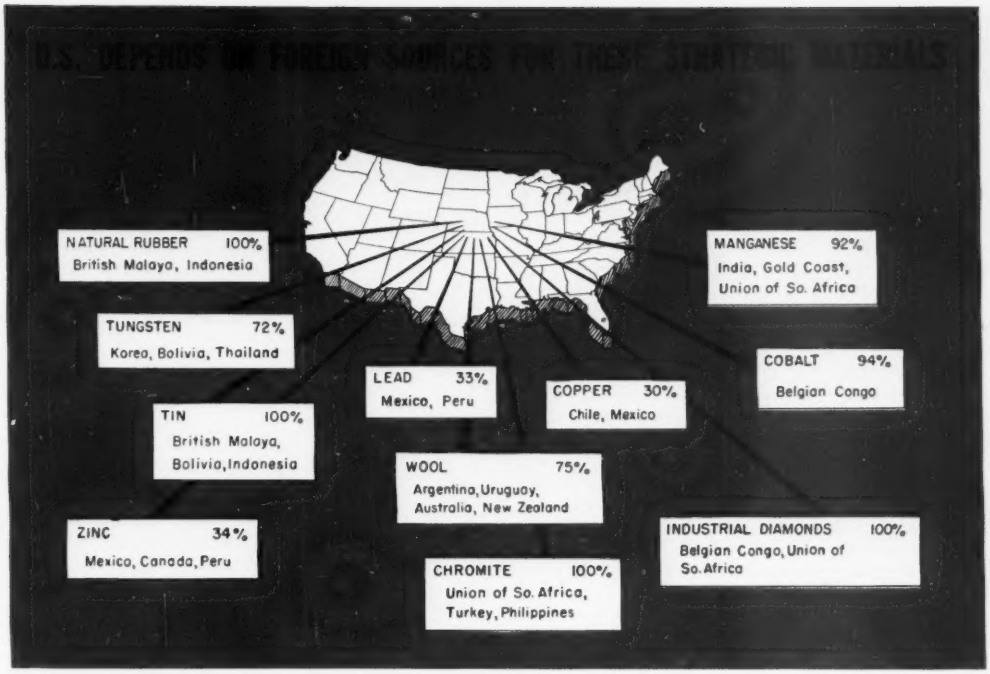
The Secretary . . . has permitted the Rural Electrification Administration to distribute to cooperatives their NPA allocations of scarce metals. Depa officials wanted to handle these just as they do those for private companies. Chapman also approved installation of more aluminum capacity in the power-deficient Pacific Northwest. He based his ruling on the fact that power would be sufficient if median water condition prevail. In 20 of the past 26 years water conditions have been median or better.

Depa has also been making studies of power supply. In its last report it found that power supply was adequate. As an indication of this Depa hasn't bothered to staff its Utilization Conservation Branch which will handle any brownouts or blackouts necessary.

Both Depa and PED have been acting like "big brothers" to those under their control. Many of their actions have been informal. A policy of cooperation has been followed that has done much to aid manufacturers and utilities, especially the smaller companies that are unable to support Washington offices.

This "Big Brother" Policy . . . may have been due in part to lack of manpower. Both Manly Fleischmann, NPA administrator, and Clifford B. McManus, Depa administrator, have had great difficulty in getting industry men to come to Washington. McManus, himself, didn't appear on the scene until January and plans to leave by July 1. There have been many changes in both staffs and more are likely.

But the main control pattern (chart) which has been established by the Defense Production Act of 1950 is likely to remain unchanged. This organization has succeeded in building up our economy in preparation for all-out war. The present controls over our economy will be changed as circumstances warrant. Prices will be pushed up and down. More or less material will be allocated. Construction will be encouraged or forbidden as desired. And not all these changes will meet with favor of the officials in charge of the various agencies. But America is still a democracy. There is still a Congress in Washington which is susceptible to pressure groups of voters. Next year is an election year. And until war comes, in Washington it will be politics as usual.



MOBILIZATION TODAY AND TOMORROW

The Pinch Is in Metals

Metals will set the pace and scope of the nation's defense effort. Steel, copper, aluminum, and lead are critically short.

Metals are the bottleneck in today's defense production effort. The four important metals most essential to the strength of the utility expansion program . . . copper, steel, lead, and aluminum are all in short supply.

Scant prospect of uncovering new domestic deposits of copper leaves future hopes of expanding the national supply tied firmly to expansion of foreign production. Anaconda's expansion in Chile holds the biggest promise, but it will not get started until 1952. Because Europe now prefers copper to dollars it is competing sharply with the U. S. for foreign supplies.

Peak military needs plus defense industry will take an estimated 25 to 30% of the steel output. Ingot capacity is now well above World War II levels with a 16% expansion in sight by 1953. It will probably be enough for comfort but not enough for complacency.

The aluminum industry's 62% expansion by 1953, now well under way, may make possible an easing of some controls by early 1952. With more aluminum in sight Depa may be expected to foster a program to swing utility construction to the light metal soon.

Lead, while not as tight as the other metals, is still in short supply. Here again imports are important. But tariffs and Europe's demands are cutting into the foreign market that provides about one-third of our supply.

COPPER . . . Imports are the key

The outlook for copper is totally obscured today by the current international political crisis. The statistics, as usual, tell only part of the story.

Domestic production, from ore and old scrap, accounts for roughly two thirds of our available total which, in 1950, was 1,888,221 tons. Although this exceeded all but the peak years of World War II, demand still exceeded production by 15%.

Hope for expansion of copper supply lies in boosting foreign production and opening new deposits in the U. S. Increases from neither of these sources will be felt until later this year, and not then from foreign sources, if Europe's copper needs continue to force buyers there to bid 35¢ a lb against a base price here of 24½ ¢.

Last month the Senate ratified suspension of the 2¢ import duty which has been keeping foreign copper out of the American market. The expiration date of Feb. 15, 1953 was retained with the Senate adding to the bill the proviso "or at the end of the national emergency, whichever is soon." Senate and House bills will restore duty whenever price here falls below 24¢.

Chilean Deal . . . With Chilean copper imports in 1950 accounting for 250,000 tons of the nation's supply of refined copper, interest centers around unofficial reports out of Washington of a "deal" upping the price of Chilean copper 3¢ a lb. Of this 2¢ is to be absorbed when the import tax is removed. What is to be done with the other 1¢ is still not clear. All this is to be done without altering the base price of 24½ ¢.

The agreement with Chile calls for some increase in output and adjustments in taxes levied on production.

Meanwhile at home, defense production is consuming 12% of our total supply of refined copper with indications that this proportion will increase above 20% by the end of the year. In addition, shipments to the strategic stockpile continue at about 200,000 tons per year.

To make supplies available for defense-supporting industrial activity, use of copper for non-priority activities will be cut during the April-June period to 75% of the average use in the first half of 1950.

Use By Wire Mills . . . Latest figures on the consumption of refined copper by U. S. wire mills show a rate of 57,716 tons for January '51 and about the same for December '50. Total consumption by wire mills last year aggregated 750,000 tons. This is about half the total refined copper supply from U. S. ores plus net imports.

Electric utility and REA requests to Depa for copper allocations during the second quarter of 1951 aggregated 59,350 tons, of which 8,000 tons was to be met from inventory. Of the remaining net tonnage of 51,350 tons requested NPA granted 43,650 tons or 85%. REA's requests totaled 8,050 tons. Utility requests for copper forms and shapes aggregated an additional 3,200 tons, of which NPA allowed 2,700 tons or 84%. Of the gross requests, of 58,350 tons, 82% was for projects 15 kv and below; the remainder for projects above 15 kv.

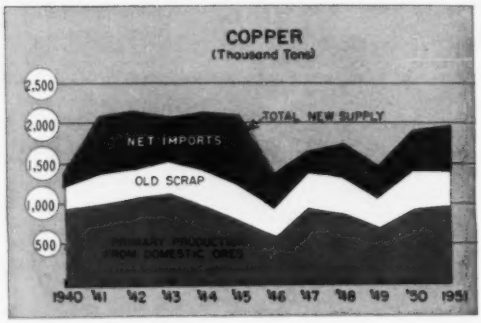
The Look Ahead . . . In the period immediately ahead there is little hope of expanding domestic copper production much beyond the levels of peak World War II.

The largest single new contribution will come from the first new unit of Anaconda's expansion program at Chuquicamata, Chile, due to start producing in early 1952. There are in the world several other important copper projects in some stage of planning. A few are in the United States, but they will not get into production within two years.

STEEL . . . Prospects encouraging

Despite the highest production rate in our history, there is a steel shortage today of substantial proportions. Even when the Korean war started, last June, there was no excess capacity. Now, with defense demands superimposed on this civilian demand, the shortage is acute.

Yet as things stand today, the steel industry can produce in one year as much steel as was consumed by the military during all of World War II.



COPPER SUPPLY from domestic ores cannot be expected to change much. Imports hold what promise there is

In 1940 steel ingot capacity of the U. S. was 81,000,000 tons. It climbed to 95,000,000 tons at the end of World War II. Last year it reached 100,563,000 tons and so far this year 105,000,000 tons. The steel industry's expansion program calls for a 16% increase in ingot capacity by 1953 to about 120,000,000 tons.

But it is not likely, even with our steel capacity utilized to the full, that there will be 16% more finished steel. As more military orders come in, there will be more and more steel produced to rigid specifications. The direct result will be more scrap. In World War II, for example, finished steel per ton of ingots dropped 4% from 1941 to 1943 causing a loss of 3,000,000 tons. If this pattern holds, a boost in ingot capacity would mean only 10% more finished steel and only 6% more fabricated products, according to the National Industrial Conference Board.

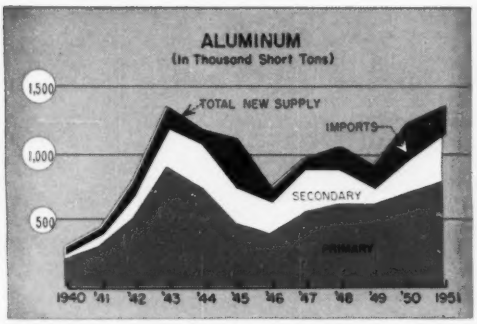
Ingot capacity can reach 120,000,000 tons early in 1953. From this would come 85,000,000 to 88,000,000 tons of rolled, drawn, and forged steel. The military is not apt to need more than 40,000,000 tons of this. Another 40,000,000 tons would be ample for essential civilian needs, including 7,000,000 tons for the railroads, 7,000,000 for the petroleum industry, and 17,000,000 tons for other industry expansion programs. Upwards of 10,000,000 tons would be left for civilian goods output. This tonnage would have to be allocated among producers of automobiles, homes, appliances, furniture, toys, etc.

The Situation Today . . . During the first three months of '51, military needs took 12% of total steel production. By the end of the year this proportion will be nearer 20%.

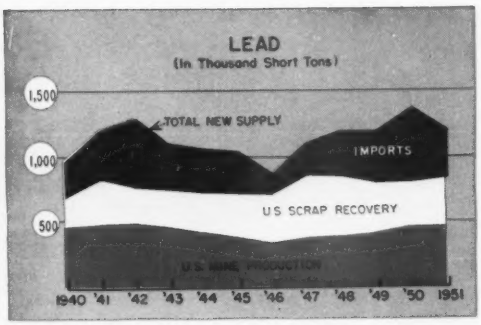
So that steel will be available for military and essential civilian needs, the new controls limit the amount of steel going into consumer durable goods in the second quarter of this year to 80% of use in the first half of 1950.

ALUMINUM . . . Relief in sight

Expansion plans announced by the U.S. aluminum industry add up to a 62% increase in primary metal capacity by 1953. Even by the end of this year primary capacity will reach 915,000 tons, up 22% from the 750,000



ALUMINUM INDUSTRY expansion of 62% over mid-1950 promises ample supply by 1953. Controls may be eased



LEAD while scarce is not as critically short as other metals. Europe's drain on lead imports is shrinking our foreign supply

tons capacity of mid-1950. By 1953 industry expansion in the U.S. alone will bring capacity to 1,300,000 tons, an increase of 468,000 tons over the mid-1950 capacity.

During World War II the aluminum industry increased its capacity seven-fold—to a peak of 1,175,000 tons a year. Military production took about 90% of total aluminum consumed during World War II.

In the present emergency the outlook is considerably more optimistic. Military requirements for aluminum this year are expected to be 25% of total supply. For the April-June quarter the permitted nondefense use is restricted to 65%. However, the increasing supply may make it possible to relax these controls in 12 to 18 months.

The Utilities Position . . . In this allocation program the electric utility industry enjoys a preferred position. For the second quarter of 1951, for example, the utility and REA requests to Depa totaled 27,600 tons of which 850 tons could be met from inventory. This left a net requested tonnage of 26,760 tons. Of this amount NPA allocated 24,500 tons or 91% of the requested amount. Of the gross requests, 17,950 tons were for projects above 15 kv; the remainder or 9,650 tons was for projects 15 kv and below.

With relief in aluminum supplies in sight after the first of next year and copper available in declining amounts, because its production is not susceptible to substantial increases, Depa will foster a program to swing much of the utilities' construction to aluminum.

Canadian Expansion . . . In spite of the rejection of an offer to deliver 220,000 tons of aluminum to the government stockpile by 1953, Aluminum Limited's Canadian subsidiary is going ahead with its own expansion program. This involves the first step of a vast integrated aluminum development in British Columbia and the construction of another major hydroelectric plant in the Province of Quebec which will increase Canadian aluminum productive capacity 165,000 tons a year. With this increase the usable integrated capacity in Canada will be 606,265 tons.

U. S. Expansion Program . . . In the U. S. three present primary producers and two newcomers to the field are planning new facilities for production of primary aluminum, aggregating 468,000 tons by 1953. This new capacity does not include 79,000 tons of idle capacity to be reactivated during 1951, by Alcoa at its Massena, N. Y., and Badin, N. C., plants.

LEAD . . . Not quite so critical

The supply of lead this year will barely take care of the needs of defense, military requirements, and industry. Consumers may take a measure of comfort, however, from the fact that the supply problem, for lead, will be far less serious than for other metals.

Lead supply for use in the U. S. will probably be about 1,100,000 tons or a little over 80% of the 1,346,000 tons in 1950, according to American Smelting & Refining Co estimates. This reduced supply springs from the shrinkage of imports which will be about 50% of what they were in 1950.

Our shrinkage lead imports . . . upon which we depend for a third of our supply . . . trace back to a jump in import duties, a drop off in selling pressure by dollar-hungry Europe, and the fact that Europe wants lead badly enough to pay higher prices than those prevailing here.

The 1950 Supply Picture . . . The output of U. S. lead mines in 1950 was 430,000 tons, highest since 1943. Imports too broke all previous records, totaling 521,000 tons against 385,000 tons in 1949. Lead recovered from scrap amounted to 395,000 tons. All three sources added together come to 1,346,000 tons in 1950 against 1,207,000 tons in 1949.

Subtracting 131,000 tons that went to the strategic stockpile last year, domestic consumption was 1,215,000 tons. Of this amount storage battery production took about 400,000 tons or about one-third of the total. Lead used for cable coverings of all types took another 140,000 tons and solder 95,000 tons. Bearing metal took 32,000 tons.

The 1951 Supply . . . Providing there is no interruption of mine operations in the U. S. during 1951, lead industry sources estimate that mine output this year will equal or slightly exceed last year. A conservative guess would be 440,000 tons. Recovery from scrap could reach 400,000 tons, but imports will be about half of last year's or about 260,000 tons.

10 suggestions that will help both manufacturer and

1 Use Standard equipment

2 Supply complete information with order

3 Waive witness tests

4 Expedite approval of drawings

5 Avoid changes after order has been placed

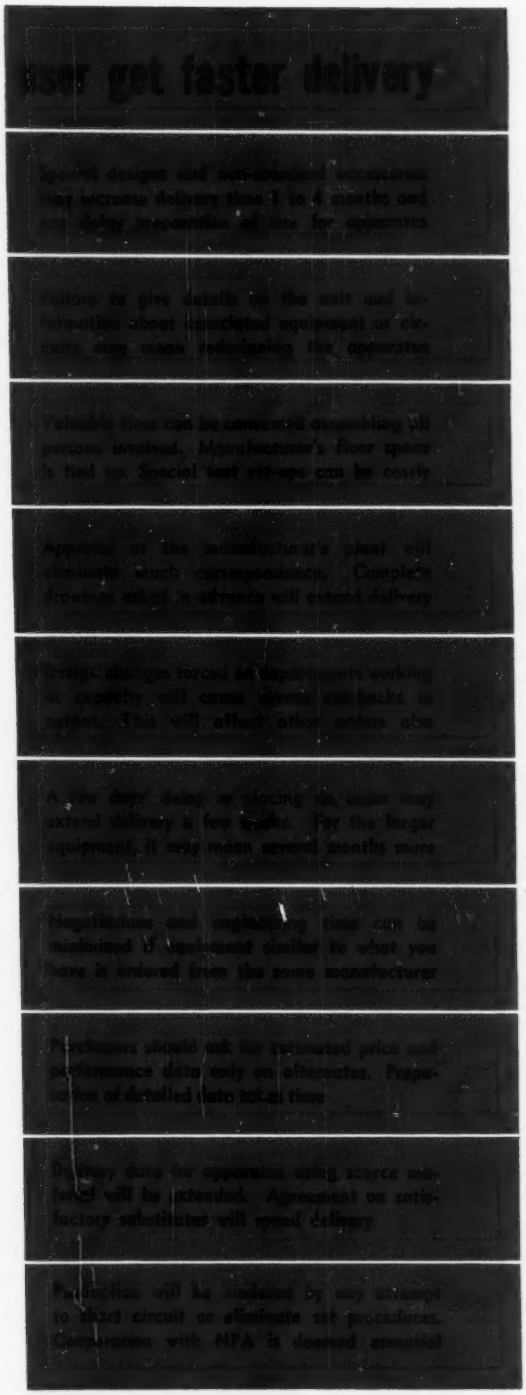
6 Place orders early

7 Order duplicate equipment

8 Keep alternate proposals to a minimum

9 Agree to possible substitutions of materials

10 Follow established NPA procedures



How To Obtain The Best Delivery On Electrical Equipment

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The growth of the electric power industry in recent years has been colossal. It will be equally colossal in the next few years. Although the power requirements for homes, farms, and commercial establishments have been on the increase, the largest growth is in the industrial field. The present defense program has made tremendous demands on industry that have been passed on to power companies in the form of greatly increased demands for their service.

Power requirements for the atomic energy program, for instance, are mounting. The new plant of the AEC at Paducah, Kentucky and the "hydrogen bomb plant" in South Carolina will require an estimated two million kilowatts. Wind tunnels used in aviation research programs require large blocks of power. The growing demand for aluminum in the defense program also means a substantial increase in the power requirements of the aluminum industry. This rapid increase in load means but one thing to the power company: The installation of additional generation and distribution apparatus in the shortest possible time, while practically every other electric utility is trying to do exactly the same thing.

The position in which the electrical manufacturers find themselves is one of being under continuous pressure by their customers to shorten their delivery dates on purchased equipment. They are being asked to produce equipment in volumes that are well beyond their normal capacity. As a consequence, they are continuously striving to streamline their shop, engineering, and negotiation procedures in order to boost their monthly production rate. The usual hindrances in production will have to be either entirely eliminated or largely removed if they are to achieve their goal. Flood, fire, strikes, scarcity of material, or any other obstacle would be extremely serious in these times.

In addition to the steps already taken by manufacturers,

there are things that the customers can do to help achieve this goal. It is the purpose of this article to offer several suggestions that will aid both the manufacturer and the purchaser in obtaining better delivery dates on the material and equipment they require.

1. Use Standard Equipment

There is a saying that you can standardize equipment but you can't standardize people. It is recognized that certain companies have special requirements for apparatus that have considerable merit for their particular application. In these times, however, it might be well to investigate these requirements and decide whether or not some of them could be modified. The automobile and clothing industries are good examples of standardization suiting the public's taste. Two men may choose suits or automobiles that have been made from the same pattern but using different materials or trimming. It is changes in the pattern that do most to slow up production.

It is perfectly obvious that the engineering time on an order for standardized equipment is a minimum. The same is true for shop time. The reason for this is the use of standard drawings and storeroom parts, and the familiarity of the worker with a repetitive job. For example, let us look at a typical switchgear order. If a standard design were used, the delivery date would be, let us say, 10 months. For a nominal standard design, that is, a standard design with minor changes, the delivery date might be 11 months. A special design, however, might have a 14-month delivery date.

A nominal standard design might mean a standard unit with non-standard accessories. In these times, non-standard accessories could cause quite a delay in the delivery of the complete apparatus. Even the removal of standard accessories will cause delay, due to the necessity of modifying the standard drawings. Standard accessories are stocked by the manufacturer, whereas non-standard accessories must be purchased separately from outside suppliers. These suppliers may be plagued by the shortage of materials and tightened production schedules to an even greater extent than the large manufacturers, so that consequently there is a longer delivery on the items obtained from them.

Installation time for the apparatus in the field should also be considered. Outline drawings and installation dimensions for a piece of standard equipment are usually available when the order is placed. On a special design these drawings and dimensions may not be available until a much later date. This may involve holding off the building of the foundations until the equipment is completely designed. Another factor affecting installation time is the possibility of shipping many types of equipment completely wired and assembled in one piece. It is more probable that a standard unit could be handled this way than a non-standard unit.

Standard apparatus also has the advantage of simplified operation, less maintenance, less personnel training, and reduced cost. Experience has shown that there are fewer cases of field trouble on standard units due to the fact that the design has been proved on previous jobs. It has also been shown that less time is spent on training personnel if one standard design is used.

2. Supply Complete Information

Considerable time can be saved on an order if complete information is furnished when the order is entered. This information should cover details on the apparatus itself and also information on the associated equipment that affects the design of the apparatus. Lack of detailed information may mean that the engineering of the job has to be delayed, or done over again when complete information is finally obtained.

Let us take an example where the details of the apparatus were not specified. Suppose that an order were entered for a circuit breaker without specifying the ratio of the bushing current transformers, the control voltage, the size of the terminals, etc. The job is engineered on the basis of conventional practice and manufacturing information is sent to the shop. Later, specific information, different from the conventional, becomes available. Then it is necessary to re-engineer the job. New information must be written for the shop, specifying the desired equipment characteristics. This will delay shipment and make everyone unhappy.

A power line carrier order is a good example of where complete information on associated equipment is needed when the order is placed. Suppose that in the original order the customer neglected to mention that there were two short stub feeders from the line to be used. The presence of these feeders changes the characteristics of the main circuit. Since the carrier scheme was designed to operate on the line without the stub feeders, it will take additional time and expense to modify the scheme to make it operate properly where it is intended for use.

3. Waive Witness Tests

All electrical apparatus is given standard tests at the factory to determine if it meets the manufacturer's design specifications. These tests are conducted at a time convenient to the manufacturer. If witness tests are specified, valuable time might be consumed before all persons involved can be assembled. This ties up not only this particular job but also others waiting for space on the test floor.

Special tests are also time consuming. These tests require special test-floor set-ups which, along with taking up valuable time, may be very expensive. If the customer will accept the manufacturer's test, considerable time will be saved in this important phase of the manufacturing operation.

4. Expedite Approval of Drawings

A surprising amount of time can be lost getting drawings approved. If drawing approval is specified in the order, it is necessary for the shop to have this approval before starting production. Quite a bit of correspondence, in the form of letter writing, telephone calls, wires, etc., is often necessary before complete drawing approval is obtained. This correspondence has been known to delay shipment for several months. Some apparatus is of such a nature that production can be started before complete approval of drawings without affecting the finished product. In such cases deliveries could be cut considerably if draw-

ing approval is not required to be all buttoned up before production starts.

If the purchaser deems drawing approval absolutely necessary, it would be very advisable if this were done at a meeting of all the interested people. This meeting could be held at the customer's property, but it would be preferable to hold it at the manufacturer's plant, where more design personnel, exhibits, and drawings would be at hand. A meeting of this sort would accomplish in one or two days what would take much longer to do by correspondence.

There are some detail drawings that are not needed by the shop until the equipment is almost completely built. For this reason these drawings are not usually made until the manufacturing is fairly well along. If the purchaser should ask for complete drawings too far in advance of shipment, that is, before these detail drawings are normally made, the engineering department scheduled will be disrupted with an accompanied loss of production time.

5. Avoid Changes After Order Has Been Placed

Today the shop and the engineering departments are operating to capacity on an orderly planned schedule. Anything that is done to disrupt this schedule will cause a severe cut-back in the output of the department. A serious interruption in the schedule will be caused if for some reason a change in the apparatus is specified after manufacturing has started. Suppose, for instance, that the apparatus in question is 50 per cent completed and a change has to be made in the design. This would usually involve stopping work on the apparatus while additional engineering is done. If auxiliary parts are needed, time must be spent waiting for them to be made. Then when all the new parts and drawings are completed, work on the apparatus can be continued.

This would not be too bad if this particular job were the only one affected, but it's not. It means that engineers must be taken from other orders in process to devote their time to the re-engineering of the old job. The partially completed apparatus stands in the way, taking up valuable floor space in the shop. This space was scheduled for the next piece of apparatus and as a result delay is caused all along the line. This becomes a chain reaction so that all jobs following the one that was changed have their delivery dates extended.

6. Place Orders Early

Usually the sooner an order is placed, the sooner the apparatus will be delivered. This does not mean, however, that if an order is placed a few days late the delivery will be only a few days longer. Orders are being placed at an extremely rapid rate to meet the requirements of the defense effort and the industrial economy, so that a few days delay in entering the order may mean an extension in delivery of several weeks in some cases, several months in others, and still longer for the larger equipment.

7. Order Duplicate Equipment

Quite often when a purchaser is preparing to order a piece of equipment, he already has similar equipment in use. In a case of this sort, there may be quite a saving of time in ordering duplicate equipment from the manufacturer who supplied the original units. Negotiation time as well as engineering time can be reduced to a minimum. The equipment itself has the advantage of being proved in design and in operation.

8. Keep Alternate Proposals To a Minimum

In asking for bids on certain lines of apparatus, the purchaser is often inclined to ask for detailed price and performance data on several alternate pieces of equipment. The number of these alternates asked for on some transformers has been as high as ten. The preparation of these details is quite time consuming and it is suggested that the purchaser ask for estimated price and performance data only on the alternates. Using this data, the field can be narrowed to one or two alternates and detailed price and performance data on these alternates can be asked for in the bids. This procedure will result in an overall savings in negotiation time.

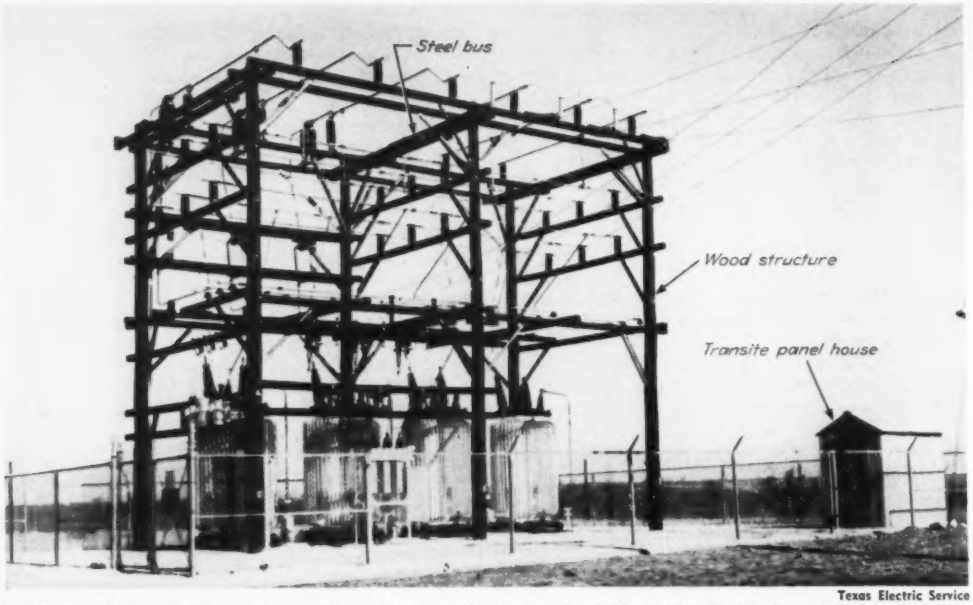
9. Agree To Possible Substitutions of Materials

During any national defense emergency there are certain materials that are made scarce by the increased military production. This scarcity of critical materials is felt very heavily by the electrical manufacturers. One of the purposes of the National Production Authority (NPA) is to insure the manufacturers obtaining enough of these materials for their approved orders. The time might come, however, when some material cannot be obtained without an appreciable delay. If such were the case, the delivery date for any apparatus using this material would have to be extended. This delivery date can be shortened if an agreement is reached between purchaser and manufacturer on a satisfactory material substitution.

10. Follow Established NPA Procedures

We are working today under a planned economy. We must all follow established rules and obviously some of the rules are rather new. If we try to short-circuit or eliminate the rules, production will be hindered rather than helped. We believe the people heading up NPA operations are very familiar with the everyday problems of the user, the supplier, and the manufacturer. We also believe that they will be very sympathetic toward any well-founded requests, but they must have complete information on such requests and they must be given honest information. Complete cooperation with the NPA is necessary for the country's production facilities to operate at their maximum efficiency.

These suggestions should in no way be construed as a set of rules that benefit only the manufacturer. These suggestions have been made in the spirit of fairness between the purchaser and manufacturer. Co-operation among all branches of the electrical industry has caused the industry to grow, and it will continue to grow to supply the needs of the nation in peace times as well as during times of national emergency.



Texas Electric Service

BACK TO WOOD structural members and steel bus bar of World War II for this substation in a Texas oil field. Corrugated Transite was used for tool house, saved 75% of cost compared to brick. Built in Ft. Worth, tool house was shipped by truck to substation site. Design uses weatherstrip to keep out dust during windstorms, prevalent in the area

MOBILIZATION TODAY AND TOMORROW

130 Shortcuts to Proved Savings

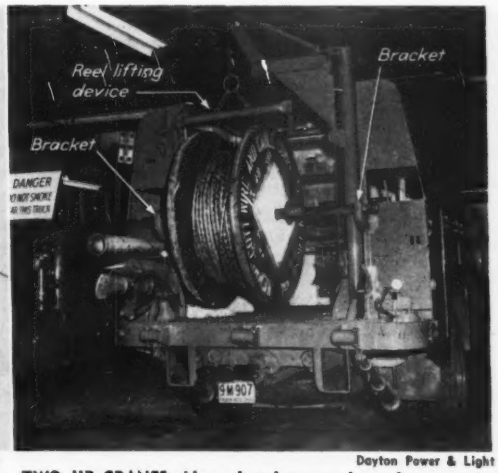
Presented here is a checklist of 130 construction, operation and maintenance methods used by utilities to save manpower, conserve materials and cut costs. Condensed from the pages of Electrical World of the last 10 years, they offer a quick reference economies in the critical mobilization periods that lie ahead

METHOD	SAVING	COMPANY	DETAILS
Generation			
Plant construction mechanized with cranes, faster material handling, careful scheduling.	100 Mw unit on line in 10 months	Todelo Edison	Sept 25, '50 p 98
Stereoscopic mapping technique inventories 39 coal piles in ten days with accuracy of 95 to 97%	Cost 25% less than ground survey	Phila Elect	Dec 18, '50 p 88
Coal siftings from stoker discharged above fire by steam ejector device in fire box	Saves 60 ton coal per month	Indianapolis Pwr & Lgt	Jan 2, '50 p 70
Pumpcrete delivery pipe cut off in progressive sections as concrete embeds scroll case	Saves $2,000 in time and material	Bureau Reclamation	Feb 13, '50 p 114
Car dumper, 8-car thawing track in loop handles coal cars without switching	Handles 75 cars/day	Toledo Edison	Mar 27, '50 p 104
Aerial photographs make topographical survey of Susquehanna at Conowingo Station possible in two days	Done at 1/10 cost of instrument survey	Phila Elect	Apr 24, '50 p 111
Cut boiler outage time by removing burner impeller plates while hot	Cuts boiler outage time in two	Kansas Gas & Elect	May 22, '50 p 138

Spray cooling of stoker grates reduces maintenance, extends interval between inspections	Inspection interval extended 2-4 weeks	Kansas Gas & Elect	June 5, '50 p 110
Alternatives for brick walls evaluated	Brick cost $4 sq ft vs 50¢-$2.35	Georgia Power	July 16, '49 p 111
Winch raises and lowers air hose, turbine and cutter used in removing scale from long boiler tubes	Labor costs cut 50%, saves hose	Detroit Edison	July 7, '45 p 119
Acid resisting paint trims maintenance on automatic sump pump parts and fittings	Life of parts increased up to 600%	Phila Elect	Sept 15, '45 p 119
Fourteen measures detailed for conservation of artificial materials in power plant design	Construction materials	Sargent & Lundy	July 10, '43 p 53
Condensing water chlorination averts cleaning saves fuel	$11,064 per year	Dayton Pwr & Lgt	June 26, '43 p 36
Materials conserved, costs cut by outdoor plant design	$6 or more per kw	Ebasco Services	Mar 20, '43 p 68
Rearrangement of coal handling trims cost of operation	6 cents per ton	Interstate Pwr	Feb. 6, '43 p 68
Streamlined power plant maintenance schedules take fewer men	Manpower	Stone & Webster	Mar 6, '43 p 52
Turbining of boiler tubes throughout removes silica	25% more capacity	Northwestern Elect	Dec 12, '42 p 95
Load swing control removes tax on boiler capacity	20% capacity released	Consol Edison	Nov 28, '42 p 51
Maintenance time minimized by careful study of operating records	Manpower	Union Elect	Oct 31, '42 p 64
32 sectors where critical materials can be saved in power plants	Material	Philadelphia Elect	May 30, '42 p 142
Air blown into diversion tunnel reduces roof friction	15% of generation	Pub Ser of Colorado	May 17, '41 p 72
Stainless steel trash-rack bars avoid sandblasting, paint	Maintenance time	Penn Water & Power	Sept. 7, '40 p 82
Condenser tube repair avoids complete replacement	$84,000	Pub Service of Indiana	May 18, '40 p 72
Turbine bearing rebabbitted by welding in field for $75	$1,400	So Colo Pwr	May 4, '40 p 76

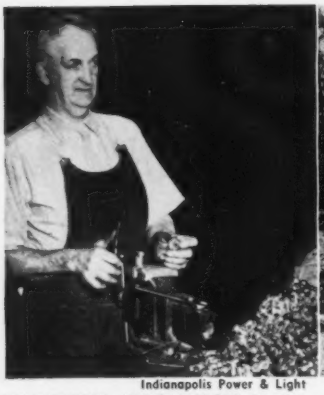
Toledo Edison

BLASTING SLAG from outside of boiler tubes with a shotgun is faster, easier, and more pleasant than old methods. Test on old piece of tubing and on boiler down for repair proved no damage would result. Long before boiler is cool, gun blast rips off chunks of slag, saving time and hard work



Dayton Power & Light

TWO JIB CRANES side and end mounted put heavy equipment on and off line trucks. Powered by truck motor, jib cranes handle 1,500 lb, are operated by two men. Attachment on winch line permits lifting reels into brackets on tail of truck where wire can be paid out as truck moves down road



Indianapolis Power & Light

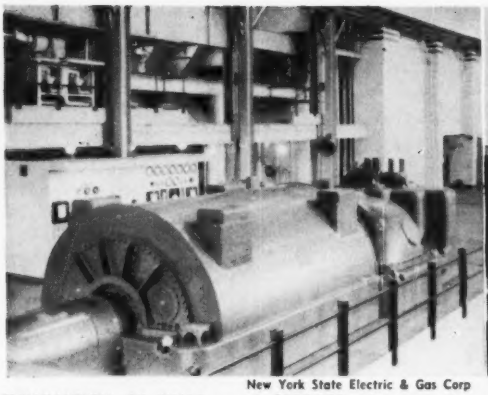
CONNECTORS ARE SALVAGED for this company by state board of Industrial Aid and Rehabilitation for Blind, releasing company manpower for other jobs

Cleveland Electric Illuminating Co

BUSHWACKER shown clearing brush under towers of 132 kv line near Cleveland is one of first used by electric utility. Used for clearing transmission right-of-way it grinds up second-growth debris, leaves trail of mulch. Can clear 5 acres of land per day normally; handle trees up to 6 in. diameter

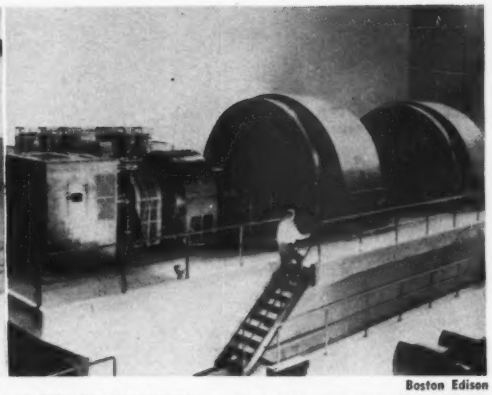
Transmission

Elevating platforms, special cranes, power reels build 73 mile 138 kv line in record time	Build 36 two-pole structures per day	Idaho Power	Jan. 16, '51 p 60
Dead-end tower replaced without service interruption by interlacing new tower with old	Cost reduced much below estimate	Toledo Edison	Feb 26, '51 p 116
Aerial cable bracketed to bridge steel saves cost of special structures	Save $3,000 vs open wire alternative	So Carolina Elect & Gas	Dec 4, '50 p 103
Structure design keyed to terrain requirements to save steel and investment	Save up to $6,300 per mile	Bonneville Power Admin	Nov 6, '50 p 86
Taper conductors and eliminate steel armor from 20,000 ft 15-kv submarine cable near Pensacola, Fla.	Saved $20,000	Gulf Power & So Services	Oct 23, '50 p 91
Helicopter scouts route of 30 mile line in 16 hr	Saves 6 week ground survey	So Cal Edison	July 31, '50 p 95
Rig with close tension and speed control removes and restrings wire faster	Cuts 75% off time	So Cal Edison	July 3, '50 p 92
Pick-up trucks act as tenders to heavy construction trucks, handle and distribute materials	Saves 30 min crew time loading	Louisiana Pwr & Lgt	Mar 27, '50 p 114
Aerial profiling to 60 mile, 132-kv line cuts engineering cost in two. Construction completed in 13 mo	Engineering cost halved	West Penn Power	Apr. 10, '50 p 89
Helicopter lays pulling cable for transmission cable over difficult terrain	Saved 4 weeks; 60% of labor cost	Hawaiian Elect	Apr 10, '50 p 96
Wash insulators with 500-600 psi hose stream from nest on truck mounted boom	Do 30 poles a day	So Cal Edison	July 2, '49 p 88
Patrol transmission lines from planes, helicopters	Plane does 28 mi/hr Ground 4-10 mi/day	Survey of several utilities	Mar 26, '49 p 87
Six 2 way radios direct sagging of 4,800 ft span	Job done 4/5 the time	Pacific Gas & Electric	Sept 11, '48 p 105
Closer control cable pulling tension allows longer cable pulls, permits greater manhole spacing.	Total annual saving $6,100 or 50%	Boston Edison	Dec 6, '47 p 92
Two-boom derrick for setting H-frame structures	Saves 1/3 vs setting poles singly	H. H. Walker (elect contr)	Feb 2, '46 p 84
Bulldozer frame with cable reel aid conductor stringing on 130-mile line-building project	Line construction time reduced 13%	Idaho Power	Mar 29, '47 p 72
Simplified resagging procedure removes slack from 132 kv transmission line	Halves usual man-hours	Pub. Serv. of Northern Ill	Apr 14, '45 p 121
Line post insulators avoids crossarms on 11-mile, 69-kv line, saves 26%	26% of cost	Central Ill Pub Service	Sept 30, '44 p 66



New York State Electric & Gas Corp

ELIMINATION OF WALL saved $100,000 when capacity additions were made recently at Jennison station (above) and at three other existing plants. Elimination of curtain wall saved manpower, time, and materials



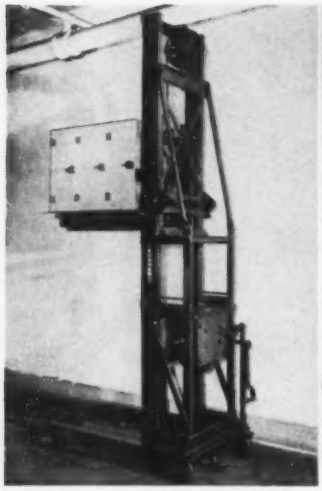
Boston Edison

40,000 KW CAPACITY at half present day costs of equivalent new capacity was attained by installing this synchonous frequency changer at L Street Station to interchange power with local transit authority. System peaks are non-coincident

Capability of 110-kv line doubled by providing 7½% boost by regulators	Cost of 2nd cable	Georgia Power	Sept 16, '44 p 83
Wood structures for 230-kv line in lieu of steel towers	158 mi of towers	U. S. Engineers	Feb 6, '43 p 38
Cleaning and waxing of high tension insulators restores flashover strength	Cost of insulators	Puget Sound Pwr & Lgt	Dec 26, '42 p 70
Insulating oil reconditioned economically	2/3 cost of oil	Narragansett Elect	Apr 19, '42 p 51
105 ft beam crane reduces cost of tower erection	50¢ per ton	Los Angeles Bur Pwr & Lgt	Feb 8, '41 p 92

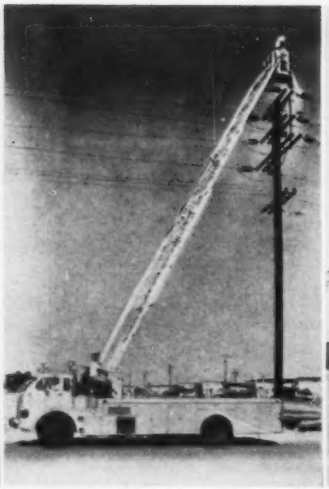
Distribution

Attachments on jeep dig trench, backfill and pull cable into newly installed duct lines	Digs 10 in 5 ft trench at 4-6 fpm	Consolidated Edison	Mar 12, '51 p 124
Spray-paint instrument transformers in simple outdoor booth at fraction of brush cost	Spray several in time to brush one	Ohio Power	Mar 12, '51 p 120
Cage on truck mounted boom saves 40% on tree trimming cost; 50% on street lighting maintenance time	Saves 40% tree trimming cost	Portland General Elect	Jan 29, '51 p 155
Pavement cutter triples speed and halves cost of mechanized pavement removal	Remove pavement three times as fast	Cleveland Elect Illuminating	Dec 18, '50 p 102
Mechanical outrigged cutter bar trims roadside hedges at rate of 2 mi per day	Costs $50/1,000 ft	Ark Valley Elect Coop	Oct 9, '50 p 124
Jeep and trailer rig sprays 541 mi roadside right-of-way for $4,425	Costs 1/10 that by contract	Huntington Co (Ind) REMC	Aug 14, '50 p 96
Aerial cable secondary network postpones underground network in Chattanooga business district	Investment postponed	Chattanooga Elect Pwr Brd	Aug 14, '50 p 76
Construction aids—reel brake, swivel, supports—cut cost of stringing multilex wire in two	Cut cost per ft from $2.23 to $1.03	Detroit Edison	July 3, '50 p 86
Templates permit engineers to set up calculating board for complicated network in two hours	Cut set up time from 13 to 2 hrs	Philadelphia Electric	May 8, '50 p 106
Polyethylene insulation and aluminum conductor used in service drop cable	Cost 52% less	American Gas & Elect	May 8, '50 p 106
Manhole dirt formerly scooped by hand now sluiced with water and pumped out	Time cut 75%	Consolidated Edison	Feb 13, '50 p 100
Badly deteriorated power transformers rebuilt at 55-51% of the cost of new transformers	Rebuild transformer at 51-55% cost new	Alabama Power	Dec 17, '49 p 118



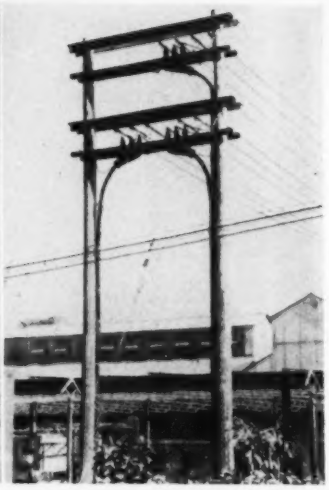
Commonwealth Edison

INSTEAD OF using block and tackle, ladders, and a scaffold plank to install high-voltage disconnect switch cabinets, a specially-designed, hand-operated 1,000-lb platform lift is used to raise cabinets to the right height and slide them into position. Substantial labor saving has been realized by its use



Los Angles Dept of Water & Power

WASHING UNIT for cleaning transmission line insulators allows hoseman in crow's nest to control pressures up to 1,000 psi. Ladder is controlled hydraulically by operator at its base. Details for this commercially built unit were based on the company's many years of experience with washing

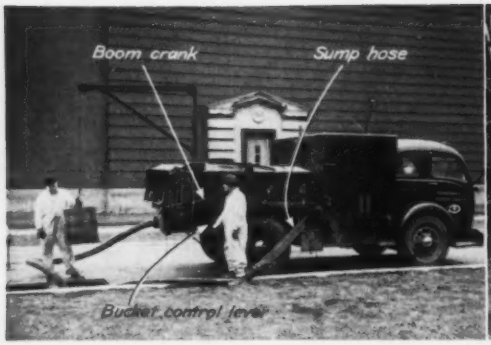


Connecticut Power Co

EFFECTIVE POTHEAD USE was made in this service to a Connecticut factory. Three incoming circuits are supported from four double crossarms of 3½ in. angles at top, carry 3-ph, 4-w 13-kv mill supply. Just below is its supply cable pothead. Further down are two 4kv emergency feeds and potheads

METHOD	SAVING	COMPANY	DETAILS
Increased manhole spacing, re-usable forms, machine excavating, pneumatic rodding cut underground costs	Save 1/5 estimated costs	Oklahoma Gas & Elect	Dec 3, '49 p 104
Water spray cooling of network transformers permits uprating	Postpones need for 31 new transformers	Union Electric	Nov 10, '49 p 109
Mechanization program cuts cost of construction operations; 38 machine applications listed	Savings as high as 97% in some cases	Cleveland Elec Illuminating	Aug 27, '49 p 90
Pioneers with aerial cable secondary network—avoids need for underground system.	Avoids underground investment	Texas Power & Light	July 2, '49 p 59
Truck mounted stringing rig for pulling conductor doubles stringing rate with same manpower	Doubles stringing rate	San Diego Gas & Electric	July 30, '49 p 96
Air motor driven auger is four times faster than pipe pusher for boring under obstacles	Four times faster	Toledo Edison	June 5, '48 p 114
Reconditioning transformer oil	Cuts overall loss to 6 to 8%	City Pub Ser Bd San Antonio	June 21, '47 p 84
Mucking pump digs pole hole in 10 min	Cuts hole digging time to 10 min	Public Service of Colorado	Feb 1, '47 p 64
Rubber glove patching and repair method	Saves 700 pairs gloves in 30 mo	Public Ser Elect & Gas co (NJ)	Mar 17, '45 p 126
Safety turntable for cable reel	Halves unloading time—cuts accidents	Kansas City Pwr & Lgt	Aug 4, '45 p 124
Pole-top heart-rot repaired for $9 by filler of flyash and pentachlorophenol	Cost of new pole	Commonwealth Edison	Dec 23, '44 p 77
House-to-house secondary bus, uses less wire than service drops	Copper wire	Louisville Gas & Elect	Dec 11, '43 p 106
Strategic extension to arc furnaces avoids new line building	162 T copper 10 T lead	Duquesne Light	Nov 11, '43 p 70
Cable sheath breaks repaired in duct with cable in service	Buying new cable	Kansas City Pwr & Lgt	July 24, '43 p 124
Concrete cone anchors replace conventional steel one	4 tons of steel	Wis Elect Pwr	Dec 26, '42 p 82

Shifting 9 transformers releases unused capacity	3000 kva	Duquesne Lgt	Sept 19, '42 p 94
Victory joint of wartime wiping solder conserves tin	60% of tin	Bell Laboratories	June 27, '42 p 92
Emergency splice for aerial cable installed in 2 hrs	Maintenance time	Cen Hudson Gas & Elect	Sept 21, '40 p 84
Voltage lowered temporarily 15-kv to 2.3-kv to work on energized line	Outage time	Interstate Pwr	May 4, '40 p 78
Substations			
Square ventilated 5,000-amp bus uses less copper than interlaced copper bar bus	Saved 21 lb/ft	Va Elect Pwr	Dec 4, '50 p 118
Control cables in overhead conduit, control houses next to equipment; save labor, material	Cost reduced about one-third	Consumers Pwr	Nov 6, '50 p 81
Reused steel cuts $2,500 from cost of 13-2.4-kv sub	Saved $2,500	Miss Pwr & Lgt	July 3, '50 p 98
Cuts manhours required to clean dead insulators and bushings by using 600-800 psi spray outfit	Cut time 75%	So Cal Edison	May 22, '50 p 134
Operate substation during moderinzation from portable control house	Cuts outages & job time 10-20%	So Cal Edison	April 23, '49 p 100
Air cooling reduces ambient temperature in 9 urban substations; permit rerating equipment	Boosts capacity 60%	Phila Electric	July 16, '49 p 71
Placing street light and other equipment over station board	Saves 3,600 sq ft floor space	Municipal, Tarentum, Pa	July 21, '45 p 166
One-third ton of steel conserved by resort to 3-pole transformer structure	1/3 ton steel	Okla Gas & Elect	Dec 11, '43 p 96
Ground pad welded from overstock of crossarm braces	Scrap loss	Va Pub Ser	Oct 2, '43 p 80
Modified design of switching station uses treated structure timbers	80 tons steel 9 tons copper	Pub Ser Elect & Gas	June 12, '43 p 64
Reinforced wood structure program greatly reduces critical material use	Half the steel	Jersey Central Pwr & Lgt	Mar 6, '43 p 49
1500 Kva substation constructed wholly from salvaged material	Cost of new unit	Cambridge Elect Light	May 30, '42 p 123
Wooden members avoid use of steel and zinc for 6-kva substation	10 to 20% of cost	Consumers Pwr	Apr 18, '42 p 100
Store Room			
Anneal hard drawn wire instead of selling it as scrap	Save $6,000 per yr	Louisiana Power	Apr 9, '51 p 124
Recover aluminum wire with insulation stripper	Saves critical aluminum wire	Ohio Power	Dec 4, '50 p 139
Timely disposal of scrap triples revenue	$1,648,000 saved	Consolidated Edison	Nov 5, '49 p 81
Cable salvage procedure reclaims 333,000 ft out of 373,000 ft processed in 10 years	250,000 ft cable for reuse	Boston Edison	July 31, '48 p 116
Brackets (for ladders) readily made from two surplus crosarm braces	5 lbs steel	Worcester County Elect	Dec 9, '44 p 126
Wire salvaged by pinching off insulation between grooved rolls	Copper tonnage	Utah Pwr & Lgt	Oct 30, '43 p 68
Obsolete material reclassified for use-up or release as scrap	Cost of new stock	Kansas Gas & Elect	Sept 18, '43 p 103
Insulating oil re-refined at outlay of 8¢ per gallon	500,000 gal potential	Penn Elect	Sept 18, '43 p 71
Armor rods straightened for re-use by pulling through pipe	2800 rods	Wisconsin Pwr	Sept 4, '43 p 116
Conductor, hardware, lamps and insulators salvaged	Cost of new stocks	Puget Sound Pwr & Lgt	May 1, '43 p 50
Insulator testing converted to be a one-man job	One man	Northwestern Elect	Feb 6, '43 p 83



Commonwealth Edison Co

SPECIAL TRUCK makes cleaning of manholes easier and less costly. Truck features gasoline-engine-driven, 500-gpm sludge pump and a special dump bucket which is raised or lowered on a wire rope from a swinging boom. Power is obtained from a power take-off. This truck can clean 13 manholes a day

Detroit Edison Co

BATTERIES on truck with two-way radio are kept charged even though the truck is standing, by a 6-v 500-w dc generator on front of truck. Driven by 1 hp single cylinder, 4-cycle gas engine supplied from truck's gas tank by electric fuel pump. Engine is push button start, weighs 77 lb, cost $180

Old transformer bushings rebuilt better at quarter cost	$150 each	Portland Gen Elect	Jan 9, '43 p 70
Worn, weatherproof wire resurfaced with new coating	New wire	Washington Water Pwr	Mar 6, '43 p 88
Die strips insulation in salvaging copper wire (WP)	10¢ per lb	Idaho Pwr	Mar 21, '42 p 101
Outdated equipment salvaged for second use	Upwards of $5,000	Portland Gen Elect	Feb 7, '42 p 80
Meters			
Three men test 60 meters per 8 hr day from mobile testing trucks	Three men test 60 meters per day	Duquesne Light	Aug 28, '50 p 94
Meter testers reset time switches with external key in seconds	Resetting time seconds vs min	Phila Elect	June 5, '50 p 114
Mechanized methods shop test meters in 33 minutes	Handle 160 meters per day	Penn Pwr & Lgt	July 17, '48 p 66
System-wide processing of meters by change out method done from meter shop in trailer	Save 1.203 manhours and $137/meter	West Texas Utilities	Oct 23, '48 p 90
Three-pole double-throw switch connects with other coil of three-wire meter	Saves half former testing time on 3 wire house meters	Woodstock (Ont) Pub Utilities Comn	Mar 31, '45 p 82
Power turntable revolves meter cover while scraper removes paint and dirt	Cleans meter covers 12 times faster	Indianapolis Pwr & Lgt	Apr 14, '45 p 126
Meter test board used with walk-around meter rack eliminates fatigue among testers	Tests 80 meters per day	Delaware Pwr & Lgt Co	Nov 10, '45 p 156
Meter test board socket has terminal base to receive either 2 or 3 wire socket type meters	24 meters tested in 2 hrs	Public Service of New Hampshire	Nov 24, '45 p 102
Washing machine for meter parts employs motor-driven mesh wire basket	Cleans parts effectively in 1/6 time	Pacific Gas & Elect	Jan 5, '46 p 88
Socket meter gang board has six sockets for multiple testing	More than double testing rate	Commonwealth & Sou Corp	Jan 4, '47 p 54
Flashlight battery restorer uses counter emf method	Increases life 15 times	Western Mass Elect	Sept 1, '45 p 106
Meter jewels cleaned, inspected for return to service	125% net saving	Narragansett Electric	Mar 20, '43 p 122
Removed meter seals brought in by meter testers, lead melted down	2½ lbs every day	Boston Edison	Mar 6, '43 p 76
Chemical treatment salvages usable parts of removed meters	Materials	Detroit Edison	Sept 20, '42 p 70

Electric Utilities step up trend to RM* transformers

1950 purchases of RM units up nearly 81% over 1949. Need for faster shipment, flexibility, seen as basic factors

Last year, 77 different electric utilities saved an average of 4 weeks in delivery time and 8 per cent in purchase price per transformer by specifying General Electric's RM power transformers. Their total 1950 buying resulted in an 80.6% increase in orders for standardized units.

This year, too, vital time can be saved. Right now, RM shipments are from 5 weeks to 5 months shorter, and prices are 8 per cent lower than for nonstandard units of similar ratings.

let's check this

Are you *sure* you realize *how much* flexibility in application you can obtain and still qualify for RM savings? "Loadability" and voltage ratios, for example, are worth checking again—particularly with the need for faster delivery being what it is.

General Electric Company, Schenectady 5, N. Y.

* "RM" stands for Repetitive Manufacture and covers General Electric's standardized power transformers up to 10,000 kva. You can obtain many optional features—including primary voltages—and still qualify for RM price. Special engineering is eliminated on RM transformers. As a result, prices are lower, deliveries are shorter. Booklet GEC-479 contains full information.

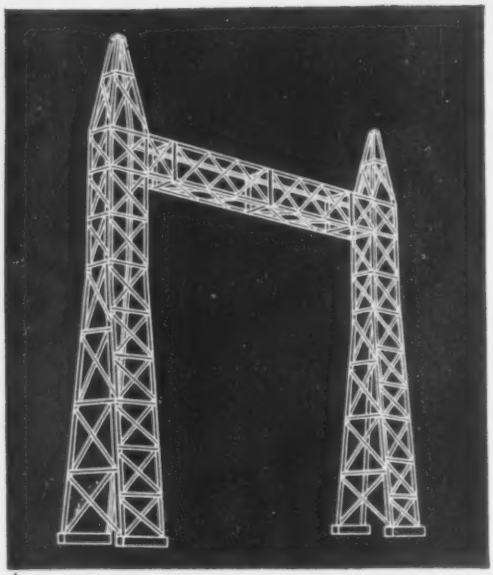
GENERAL ELECTRIC

401-47

Now.. G-E Outdoor Stations

with Standardized Structures

Available in voltage ratings from 7.5 to 230 kv

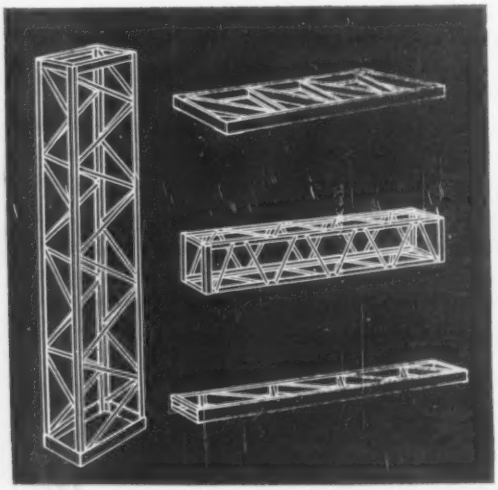


HIGH TOWER—Used for dead-ending incoming lines as well as support for incoming line disconnects. Lower truss supplied when required for support of oil circuit breaker isolating switches. Tower can be used singly or combined to make multi-bay arrangements.

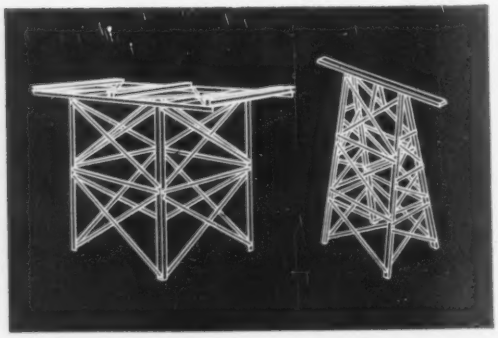
Designed as a result of 35 years of experience in outdoor station construction, G-E standardized steel structures now mean lower installed costs, less time required for station layout and engineering.

The typical components shown on this page can be combined to form an infinite variety of station arrangements. The design of all the electrical and structural items in an outdoor station must be co-ordinated mechanically and electrically if the items are to form a satisfactory installation. Sensible standardization of structural steelwork now makes it all the more practical to order it as one pre-designed component along with the other station equipment.

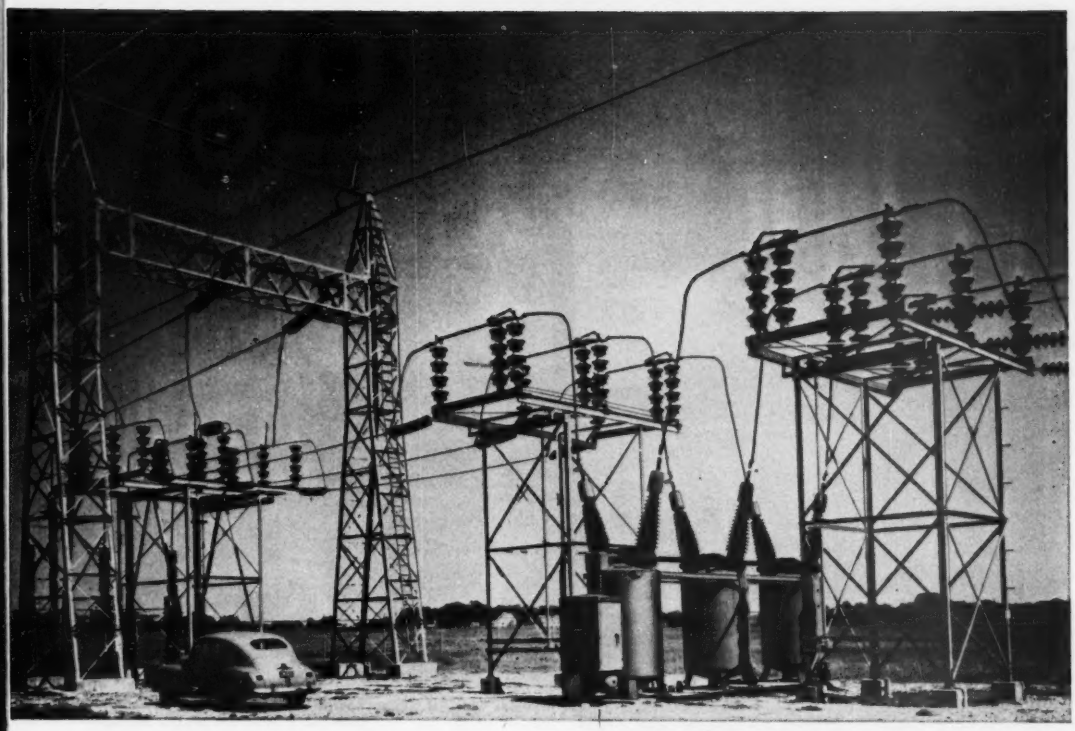
Development of these structures was a logical step in the trend towards increased standardization as a means of achieving maximum savings of time and money.



COLUMNS AND TRUSSES—Square or rectangular columns in lengths of 13'6" through 38'. Together with flat and box-type trusses, they form easily assembled "building blocks" for a wide variety of structures for mounting switches, fuses, lightning arresters, buswork, current transformers and other equipment.



SWITCH AND DEAD-END TOWERS—These towers are available in standardized dimensions to suit various voltage ratings. Design is based on a long experience with similar structures and requirements expressed by a long list of users. Other equipment available includes insulator pedestals and equipment stands.



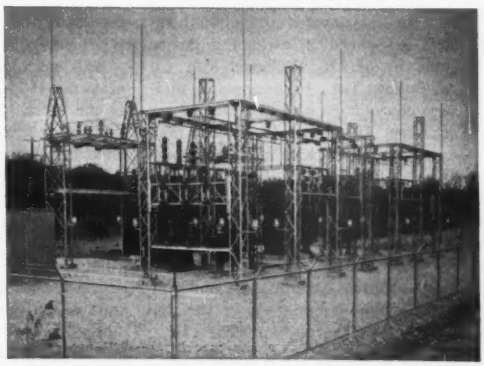
161-KV STATION showing use of standardized switch towers and high tower with one horizontal truss. This station was erected by the St. Joseph Light and Power Co., Marysville, Mo., one of the many users of G-E standardized outdoor stations.

Complete stations in standardized, pre-designed units—adaptable to every type of layout

The two outdoor stations shown here are typical examples of "building block" construction using G-E standardized structures, together with G-E switchgear, transformers and other equipment.

By ordering complete G-E outdoor stations with pre-designed, standardized structures, the tedious job of engineering and detailing separately ordered items is avoided. There is only one specification, one purchase transaction for each station. And with less time lost on detailed structural engineering, personnel can give more attention to the more important work of long range system planning.

For details of G-E standardized structures, write for Bulletin GEA-5573. For other information to help in outdoor station planning, ask for GEA-1040—Power Transformers, GEA-4985, 1642 and 4407—Oil Circuit Breakers, GEA-4980—RF Disconnecting Switches, and GEA-1304—Thyrite Lightning Arresters. *General Electric Co., Schenectady 5, New York.*

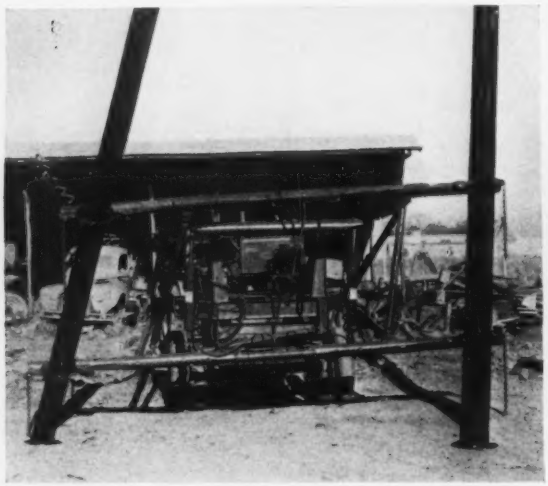


CINCINNATI GAS & ELECTRIC CO. MIDWAY STATION constructed entirely of G-E standardized structural units including latticed columns and trusses. Use of these components saved time and expense in designing, and expedited erection.

GENERAL ELECTRIC

853-5

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN



POLE-SETTING DEVICE can position H-frame structure in one-third usual time. A ten-section hydraulic valve system provides for flexible operation of the equipment. In service, power unit and positioning rams are tractor mounted

Plumb H-Frame Structures in One-Third Usual Time

Time to plumb H-frame transmission line structures is cut by two-thirds with a special pole-aligning device built by H. B. Williams Mfg Co of Dallas, Tex., to alleviate a midwest contractor's particular manpower shortage. Using this device, one man can move either pole individually, or both poles simultaneously, in any direction or manner until the structure is perpendicular.

This machine is intended for use after the H-frame structure is placed in the holes. Mounted on a tractor, this device is backed into position and affixed to the structure with hydraulically-operated boomer chains. After positioning the structure, the unit holds the H-frame in place until the dirt has been tamped in place.

Considerable reduction in labor force is effected since—even with a smaller labor crew—time per structure is reduced to one-half hour.

How to Remove Welded Transformer Tank Covers

A welded-on cover may be removed from a transformer tank, or the top section from the bottom section of a form-fit tank, by either of two procedures: Chipping out the joining weld or cutting out the weld with a gas cutting torch.

Equipment recommended to remove a weld by chipping is:

1. A heavy pneumatic chipping hammer.

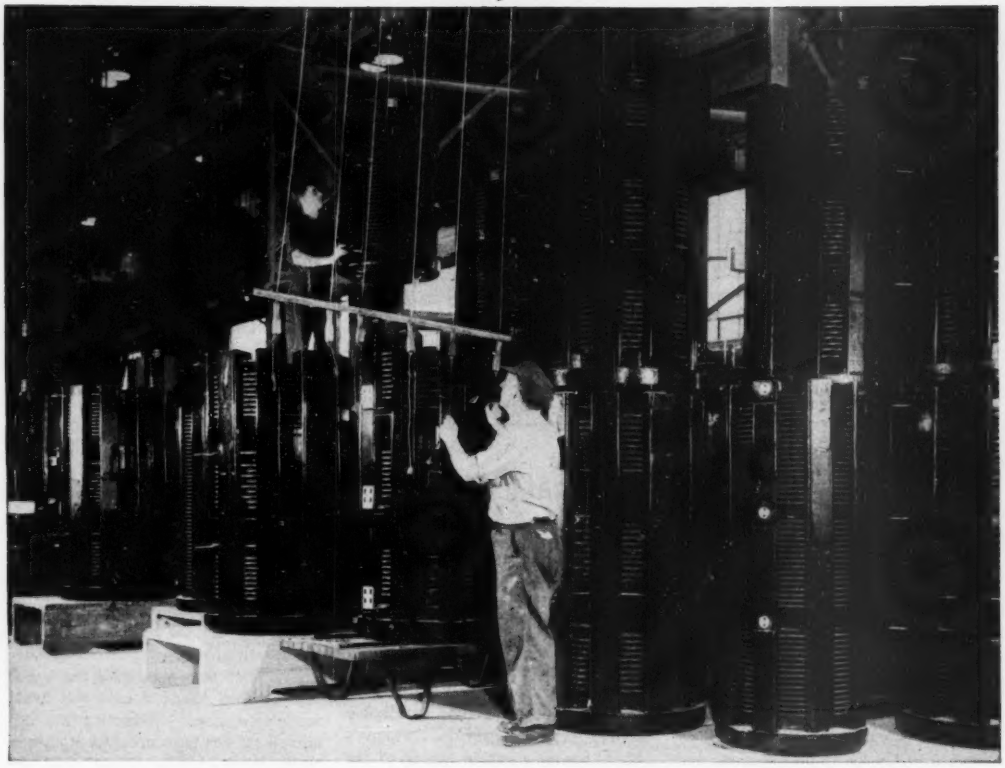
2. Diamond-pointed chisels of 3/8 and 1/8-in. They should be forged tools, hardened and tempered. Cutting edges should be ground straight with no chamfer.

3. Flat chisel with flat side relieved 1/64-in., about 1/8 in. back from the cutting edge. This prevents chisel from "digging-in" and allows operator better control of its cutting.

4. Gloves and safety glasses to protect operator.

When removing a weld by chipping, apply machine oil or grease to the surface of the weld to lubricate the cutting. A 3/8-in. diamond point chisel is used in the pneumatic hammer, the chisel being held so the diamond is pointed into the root of the joint. Chisel should cut along the vertical edge of the fillet weld, that is, along the fusion zone of the top flange, removing as much of the weld as possible. If the weld is not completely removed, more oil or grease should be spread over the remaining weld and

Adapted from "Equipment Procedure Instructions", I.L. 47-600-21B, Westinghouse Electric Corp.



Newest G.E. cast-in-concrete reactors are sturdier, more dependable, as a result of glass insulation and transposed conductors.

Glass Insulation increases life of cast-in-concrete reactors

AVOID EXPENSIVE CONCRETE VAULTS! Metal housings for reactors minimize stray current and electrical losses, and provide additional protection against possible damage from external causes. These housings can be matched to G-E metal-clad switchgear installations.

Prolonged operation of reactors at extremely high temperatures can cause rapid aging of conductor insulation. To overcome this, General Electric is now using glass insulation, on air-core current-limiting reactors. This new insulation, unaffected by moisture, will not deteriorate even at high overloads. Free of metallic impurities found in most asbestos tapes, it provides greater dielectric protection against turn-to-turn short circuits than any other type of wound insulation used in reactor manufacture.

Transposed Cable—Another Exclusive Advantage!

The cable used in G-E reactors consists of continually transposed conductors which produce lower losses and greater short-circuit strength.

These features make the General Electric reactor sturdier and more dependable. For full information on the application of cast-in-concrete reactors, get in touch with the nearest G-E Apparatus Sales Office, or write to General Electric Company, Schenectady 5, New York.

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GENERAL ELECTRIC

the flat chisel used to cut the weld flush with the horizontal and vertical surfaces of the joint. Weld metal remaining in the root of the joint is removed with the ⅛-in. diamond-point chisel.

The flat chisel is then driven directly into the root of the joint to crack the seal, as illustrated. To prevent the chisel from being driven between the joint and deforming the plates, it is moved slowly along the joint. A lifting force upon the cover or top section will help break the seal.

Weld Removal by Gas Cutting

Recommended equipment for gas cutting is:

1. A heavy duty gas cutting torch, preferably of the oxyacetylene type.
2. Heavy duty flame cutting tips, or gouging types.
3. A number of C-clamps.
4. A heavy machinist's or pneumatic hammer and a flat chisel to break the weld seal.
5. Protective equipment including gloves and goggles for the operator; nitrogen to purge the transformer tank; and hand operated carbon dioxide fire extinguishers.

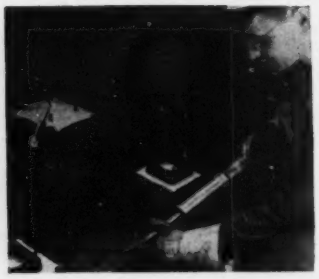
First connect a bottle of dry nitrogen to the filling plug opening and adjust the regulating valve to obtain 5 psi within the transformer. This internal nitrogen pressure prevents the flame and molten metal present during the cutting operation from entering the transformer and causing a fire.

Assemble the cutting or gouging tip to the torch, adjusting gas pressure to the recommended value for the size tip used—usually 60 to 80 psi oxygen pressure and 5 to 6 psi acetylene pressure.

With a neutral flame, heat the weld to a white heat at one corner of the tank, then simultaneously set the torch in motion along the weld and release the cutting oxygen. Continue moving the torch axially along the weld with the flame feeding onto the uncut weld. Gauge the depth of the cut so that the entire weld is removed in one pass.

Apply C-clamps to the side or sides from which the weld has been removed. This prevents the joint from opening prior to complete weld removal. Take off the clamps after the weld has been removed all around the tank and then break the weld seal as described for the chipping procedure.

CHIPPING HAMMER is held with the diamond point of ⅜-in. chisel pointed into the root of the joint. Grease on weld surface helps to lubricate the cutting



SEAL IS CRACKED by driving flat chisel into roof of joint and applying lifting force to cover. To avoid bending plates, move chisel slowly along joint

Locate Meters With Multiple Tags

THOMAS PEARSON
Meter Section
Transmission and Distribution Dept
Boston Edison Co

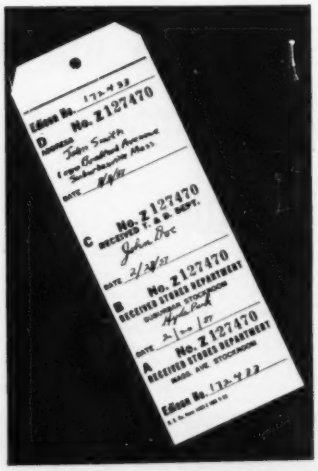
Multi-section identification tags are expediting stock control of electrical metering equipment continuously issued to system storerooms and numerous meter installers. The detachable sections serve to notify the company's central record group in Boston of the transfer of meters from one stock location to another.

The tag sections, designated as "A", "B", "C" and "D", bear the same serial numbers. Provision is made for entering the company's meter number, stockroom location, dates and other information. Each tag section is perforated for easy detachment.

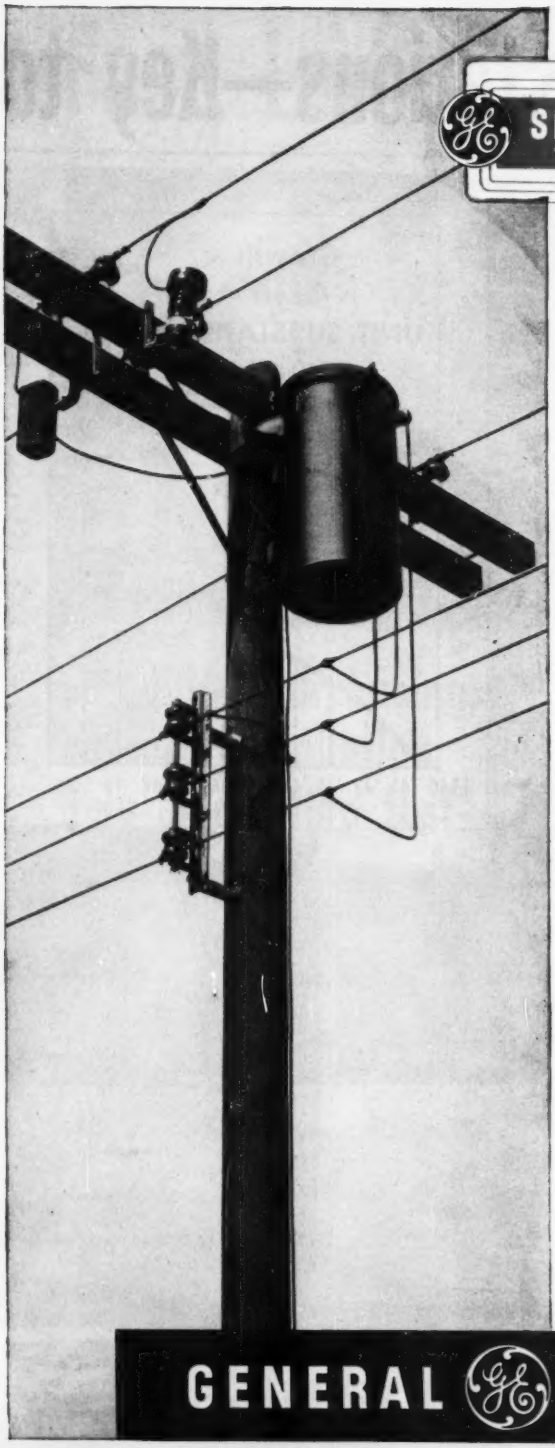
Tags are attached to each plant item of metering equipment at the time of purchase or removal from the customer's premises. Company number for the particular item of equipment is filled in on the "A" and "D" sections.

Receipt of the "A" section by the record group in the company's Boston general service building indicates that the meter has been received by the main stockroom. When the suburban stockroom receives the meter, "B" section is dated and sent to the record group in Boston. When the meter (or other equipment) is issued to an installer, the "C" section of the tag, on which the date and installer's name have been noted, is detached and forwarded to the record group. On installation, the address and date are filled in on the "D" section, which is attached to the company's completed installation order and then sent to the record group to set up or revise the record and thus clear the system.

The tag sections are maintained by the record group in tag serial number order. Successive sections of the same tag are filed together until the final section is received—indicating that the equipment has been installed at a particular location. By noting the tag serial number on the plant record card when the "A" section is received, a cross reference is set up between the company number and tag number.



TEAR OFF the sections of this tag as meter progresses from stockroom to final customer location to keep central record department informed of meter's location



SPIRAKORE* TRANSFORMERS

Finish on General Electric Transformers saves one, maybe two, repaintings

San Diego Gas and Electric has been running extensive tests on paint finishes. The Melaglyp paint on General Electric transformers, they say, is superior to any other paint tested. It will save one, maybe two, repaintings.

This is testimony from a company that has in one location almost every condition that is unfavorable to paint: Salt spray. Dry spells during which salt never washes off. Heavy dew. Intense California sunshine.

Melaglyp, a greatly improved paint made with melamine-modified Glyptal* alkyd-resin, has been standard on all G-E Spirakore transformers shipped since 1947. We are confident that you'll find this paint is cutting your maintenance cost.

** Registered trademark of General Electric Company.*

General Electric Company, Schenectady 5, N. Y.

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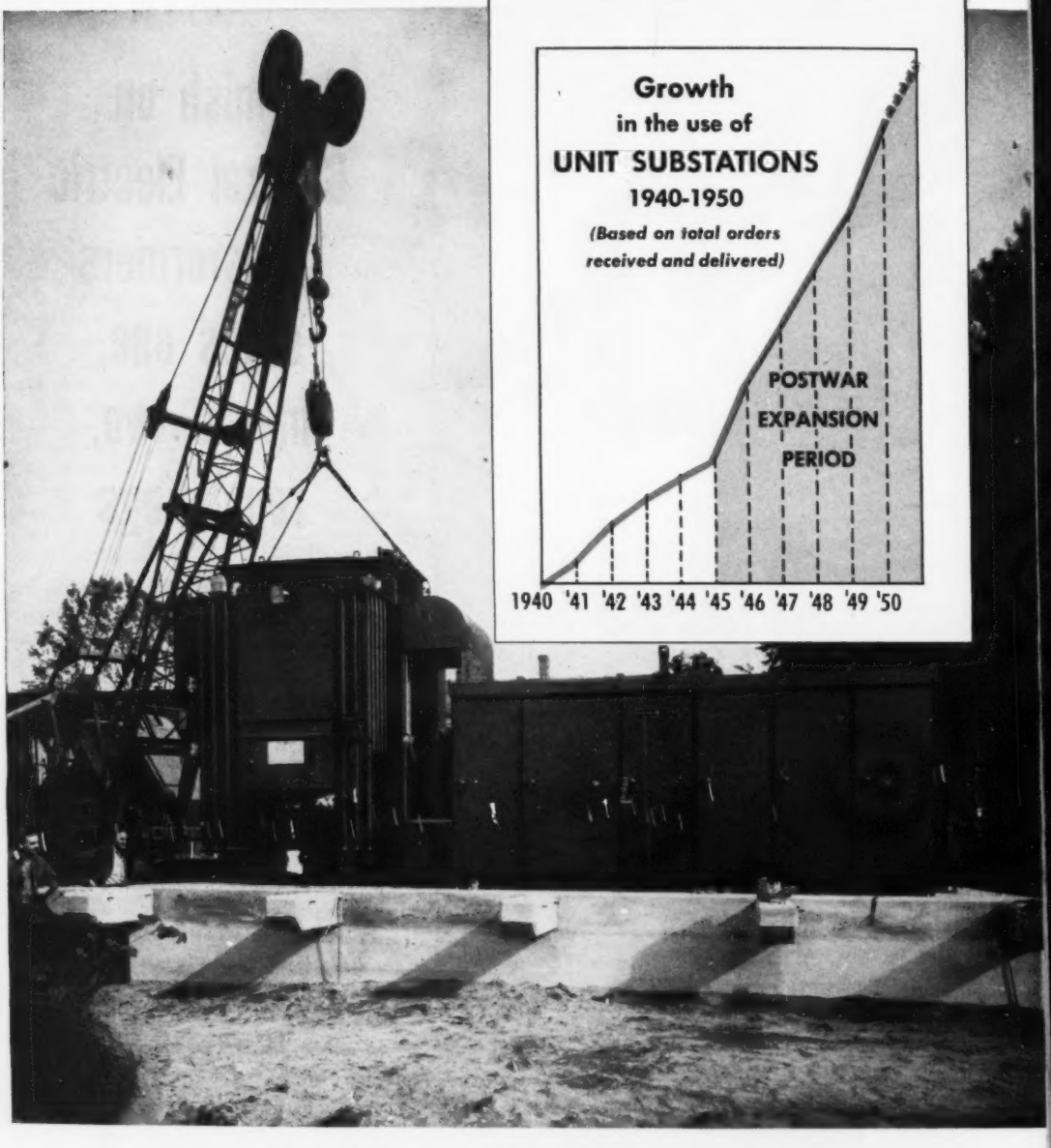
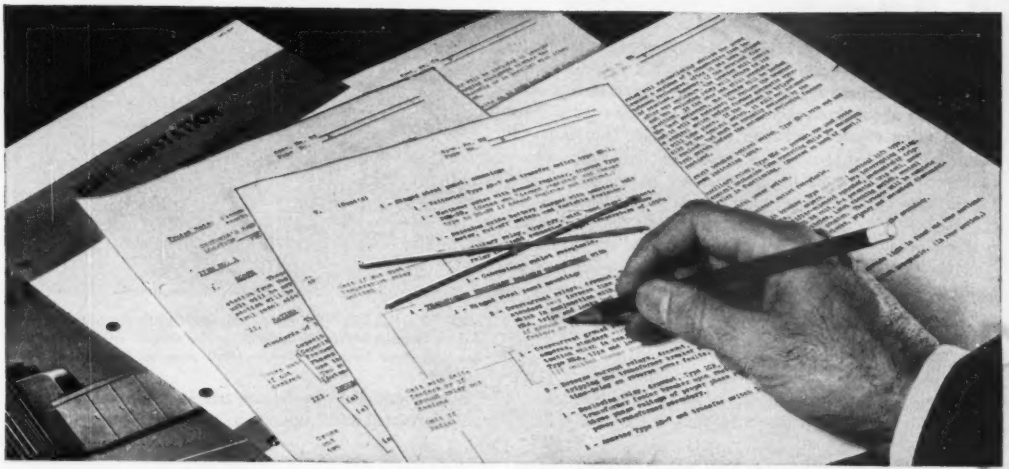
GENERAL ELECTRIC

Unit Substations—Key to



QUICK INSTALLATION: G-E unit substations come to you complete—ready for operation. You merely build the foundations, position the equipment and connect to your incoming and outgoing lines. Photo shows G-E unit substation being installed on the system of the Western Massachusetts Electric Co.

Fast, Low-cost Expansion



Simplified purchasing, ease of installation help in meeting fast-growing loads . . .

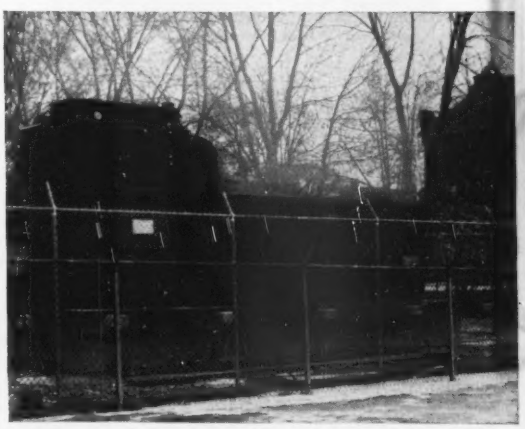
The rapid trend to factory-assembled unit substations—as shown in the chart at the left—seems sure to accelerate even more tomorrow.

Faced with the fastest-growing loads in history, utilities are finding these standardized, easy-to-install units one of their most valued tools in meeting expanding power demands quickly and at lowest cost.

Because of their great flexibility, compactness and adaptability, G-E unit substations are applicable to a wide variety of system arrangements. Standard, co-ordinated designs simplify planning and purchasing.

There's less worry about manpower and material problems. And proved, factory-engineered construction assures outstanding dependability. For full information, write for Bulletins GEA-3800 and GEA-4500. *General Electric Co., Schenectady 5, N. Y.*

WEEKS SAVED IN ORDERING! Basic guide-form specifications for G-E unit substations are available to you, and using these, you merely add ratings and number of circuits required and cross out details not applicable. Weeks are saved in detailing layouts and piecemeal ordering. Your engineers have more time for other system work.



INSTALLED RIGHT AT LOAD: Compact, modern, attractive design of G-E unit substation enables it to be installed close to the load, even in many residential areas. Vital copper for secondary circuits is saved. The substation above was installed by the Western Massachusetts Electric Co. Note church in background.

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GENERAL ELECTRIC

Helicopter Strings Duplex Line in Three Minutes

T. M. BLAKESLEE, Engineer of Transmission
Los Angeles Department of Water and Power

Using a helicopter, Los Angeles Department of Water and Power has successfully laid almost a mile of duplex conductor across rugged terrain. The operation was completed in about three minutes, but would have taken three days using regular crews on the ground. The telephone line was needed to maintain communication with a reservoir caretaker while development of a residential tract prevented continued operation of a regular telephone line.

A helicopter under contract with the department for transmission line patrol service was used. The duplex conductor was looped around one of the ground wheel struts in such a way that it could be released quickly in case of emergency. The reel was anchored near the canyon rim and included a braking device to control the payout of the line.

When the helicopter took off, it pulled the conductor across the canyon and dropped the leading end on the opposite hilltop. Here connections were subsequently made to establish the bypass telephone circuit. Walkie-talkies assisted in the operation.

LOOPED ON STRUT for quick emergency release, duplex conductor is paid out from braked reel anchored on canyon rim. Job was done by helicopter in three minutes instead of days

Mobile Network Unit Used for Radial Service

V. A. VEIT, Assistant Engineer
Transmission & Distribution Bureau
Consolidated Edison Co of New York, Inc

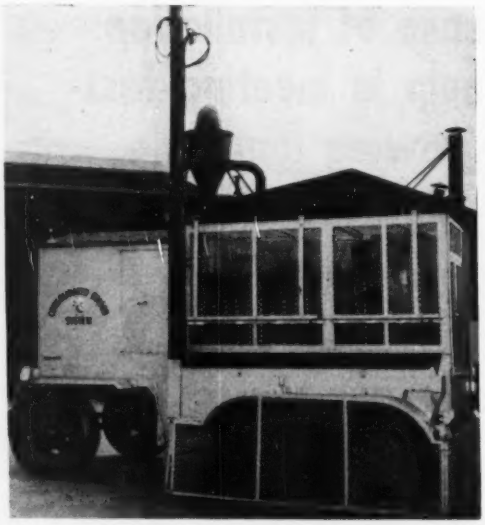
Transformer capacity is made readily available for use on the distribution system of the Consolidated Edison Co of New York, Inc, with a 500-kva, 3-phase, 4-kv network unit and accessories installed on a trailer as illustrated. This mobile unit was recently assembled using an available trailer and electrical apparatus. It is intended for use (1) To pick up load during the replacement of radial transformer banks of 500-kva capacity or less and (2) as support to the network while operating under contingency conditions. Other mobile transformer units in use on the system are not equipped with network protectors and are of inadequate capacity for this service.

The transformer, a standard submersible type, has a voltage rating of 4,330Y/2,500—2,16Y/125 and is connected Y-Y. It is equipped with subway type oil fuse cutouts and permanently connected leads on the high side. These leads may be attached to the pole on the trailer for connection to overhead feeders, or may be run through a hole in the floor of the trailer and into a manhole below.

The network protector is connected to buses on the side of the trailer. These buses are the termination point of the low-voltage cables which may be run through another hole in the trailer floor to low-voltage mains in the manhole below the trailer, or up the pole where the cables may be connected to overhead secondary. Cables used for these connections are carried on the trailer.

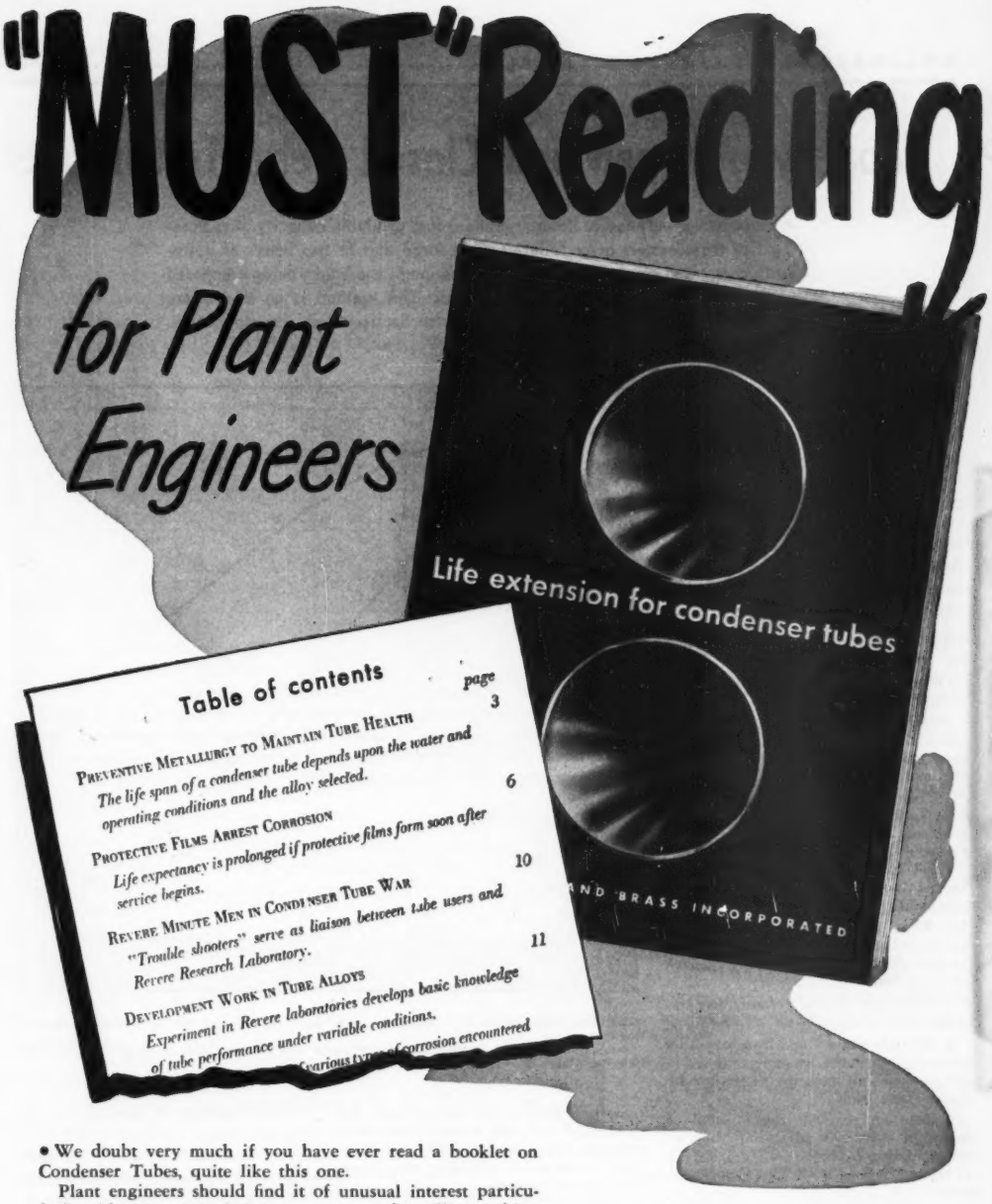
When the unit is used for radial service, the network protector is manually operated. When used for network service, it is automatically operated. A portable screen encloses the four rear wheels of the trailer, the manhole opening and cables entering the manhole.

This mobile unit is 15 ft long, 8 ft wide and 9½ ft high, and has a gross weight of 11 tons. Red light flasher type markers are mounted at the front and rear of the unit.



NETWORK UNIT TRAILER is located over manhole and screens are placed around rear wheels. Service may be either overhead or, through a hole in the trailer floor, underground

"MUST" Reading for Plant Engineers


Life extension for condenser tubes
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AND BRASS INCORPORATED

• We doubt very much if you have ever read a booklet on Condenser Tubes, quite like this one.

Plant engineers should find it of unusual interest particularly with present restrictions on copper and its alloys making it more important than ever that every last ounce of use be squeezed out of the condenser tubes in their plants.

This 28-page booklet includes data on various copper alloys, photos of cut-away tube sections showing various types of corrosion encountered in condenser tube service and photomicrographs showing the grain structure of different kinds of metals under varying operating conditions.

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Capacity of Open and Closed Delta Transformer

A procedure is outlined to determine maximum available capacity of remaining five transformers after failure of one large unit in two banks of delta-delta connected single-phase power transformers; the banks being composed of three large units and three small units. This method is an adaptation from engineering practices of Commonwealth Services, Inc., Jackson, Mich.

Accompanying curves show the total capacity of a bank of transformers composed of three units of one size and two of another size (with the same or with different impedances) in terms of the capacity of six units. (When impedances are different, the six-unit capacity is the full capacity of the low impedance bank plus the capacity of the other bank reduced by the impedance ratio.)

PROCEDURE: To determine the capacity of five single-phase units.

I. When impedances are the *same* on rating:

Read on curve A the capacity of five units in percent of six-unit capacity corresponding to (kva_2/kva_3). The limit is the load on the odd unit.

II. When impedance on rating of the two-unit bank of transformers (Z_2) is *greater* than that of the three-unit bank of transformers (Z_3):

Read on curve A the capacity of five units in percent of six-unit capacity corresponding to (kva_2/kva_3) $\times$ (Z_3/Z_2).

III. When impedance on rating of the two-unit bank of transformers (Z_2) is *smaller* than that of the three-unit bank of transformers (Z_3):

1. From curve A read percent value corresponding to (kva_2/kva_3) $\times$ (Z_3/Z_2).

2. Multiply value found from step 1 by (Z_3/Z_2) to give the five-unit capacity in terms of six-unit capacity, as limited by the odd unit load.

3. Read on curve B the capacity of five units in percent of six-unit capacity corresponding to (kva_2/kva_3) $\times$ (Z_3/Z_2) as limited by load on the low impedance units.

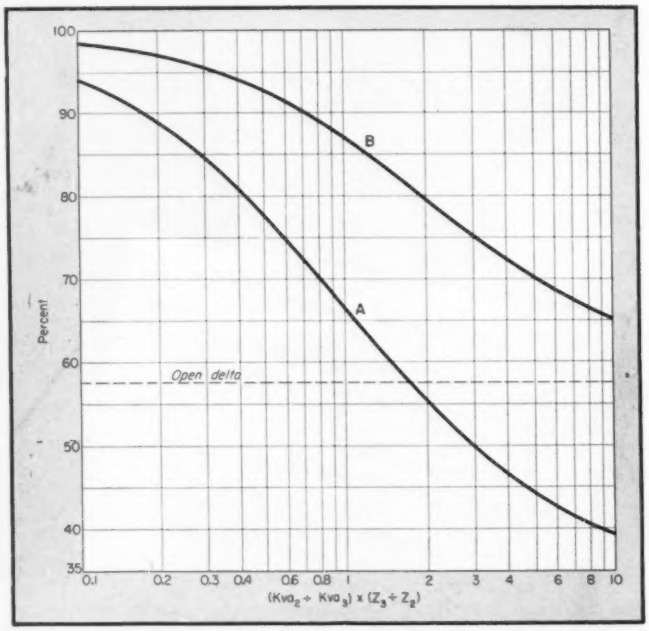
4. Bank capacity is that determined from steps 2 or 3 whichever is the smaller.

NOTES: When all transformers have the same impedance on rating, the following general observations apply to banks consisting of two large and three small transformers:

1. Whenever the name plate kva rating of the larger bank is greater than 1.73 times the rating of the smaller bank, the third small unit will become overloaded with one large unit out of service before a load equal to the open-delta capacity of four units is reached.

2. If the kva rating of the larger bank is less than 1.73 times the rating of the smaller bank, the capacity of five units is greater than that of four units.

3. Maximum benefit of adding the fifth unit is secured when all six units are of the same size, under which condition the combined capacity is 15% greater than the capacity of four units operating in open delta.



NOTE: Kva_2 = rating and Z_2 = impedance on rating of each of two units in open-delta connected transformer bank.
Kva_3 = rating and Z_3 = impedance on rating of each of three units in closed-delta connected transformer bank.

When capacity is limited by the open-delta units, the load on the other units in parallel is given by the ratio of the capacity determined from curve A to the capacity read on curve B, which is the per unit load on the heaviest loaded parallel unit (if impedances are different). Load on the other parallel unit is inversely proportional to the impedances. Similarly the load on the odd unit may be determined when capacity is limited by curve B (low impedance units).

Banks in Parallel

EXAMPLES

I—Determine capacity of a bank of single-phase power transformers composed of three units of one size and two units of another size, all units having the *same* impedance. Calculated capacity will be based on the capacity of six units.

A—Consider a bank of three 2,000-kva units with two 2,500-kva units. Using available data:

$$(kva_2/kva_1) \times (Z_1/Z_2) = 1.25.$$

From curve A, capacity is 63%. Thus the five-unit bank capacity is:

$$0.63 \times 13{,}500 \text{ or } 8{,}500 \text{ kva.}$$

B—Given a bank of three 1,000-kva units with two 3,333-kva units. By calculations:

$$(kva_2/kva_1) \times (Z_1/Z_2) = 3.33$$

From curve A, capacity is 48.8%, and in terms of the six-unit capacity is:

$$0.488 \times 13{,}000 \text{ or } 6{,}350 \text{ kva.}$$

But the open-delta capacity is:

$$57.7\% \times 13{,}000 = 7{,}500 \text{ kva}$$

In this case the larger bank is greater than 1.73 times the rating of the smaller bank. The third small unit will become overloaded with one large unit out of service before a load equal to the open-delta capacity of four units is reached; so the third 1,000-kva unit should be disconnected.

II—Determine capacity of a five-unit bank of single-phase power transformers, smaller units having *higher* impedance. Five-unit capacity will be a proportionate value of the six-unit capacity.

A—Given a bank of three 10,000-kva units with impedance of 6% and two 5,000-kva units with impedance of 12%.

Six-unit capacity is:

$$3 \times (10{,}000 + 2{,}500^a) = 37{,}500 \text{ kva}$$

And using:

$$(kva_2/kva_1) \times (Z_1/Z_2) = 0.25$$

From curve A, capacity is:

$$86.8\% \times 37{,}500 = 32{,}600 \text{ kva}$$

To determine load on the two 10,000-kva units operating in parallel with the 5,000-kva units, note from curve B that the capacity would be 96.3% or 36,100 kva. Load is:

$$(32{,}600/36{,}100) \times 10{,}000 = 9{,}030 \text{ kva}$$

Load on 5,000-kva units is:

$$9{,}010/4 = 2{,}250 \text{ kva}$$

B—A transformer bank consists of two 10,000-kva units with impedance of 6% and three 5,000-kva units with impedance of 12%.

Six-unit capacity is:

$$3 \times (10{,}000 + 2{,}500) = 37{,}500 \text{ kva}$$

And using:

$$(kva_2/kva_1) \times (Z_1/Z_2) = 4$$

From curve A, capacity is:

$$46.8\% \times (12/6)^b \times 37{,}500 = 35{,}100 \text{ kva as limited by odd unit.}$$

From curve B, capacity is:

$$72.7\% \times 37{,}500 = 27{,}300 \text{ kva}$$

the limit being 10,000-kva units

Load on the odd 5,000-kva unit is:

$$(27{,}300/35{,}000) \times 5{,}000 = 3{,}900 \text{ kva}$$

III—Determine capacity of a five-unit bank of single-phase power transformers, smaller units having *lower* impedance. Five-unit capacity will be a proportionate value of the six-unit capacity.

A—Given a bank of three 10,000-kva units with 12% impedance and two 6,667-kva units of 6% impedance.

Six-unit capacity is:

$$3 \times (6{,}667 + 5{,}000^c) = 35{,}000 \text{ kva}$$

And using:

$$(kva_2/kva_1) \times (Z_1/Z_2) = 1.33$$

From curve A, capacity would be:

$$61.9\% \times (12/6)^d \times 35{,}000 = 43{,}400 \text{ kva}$$

as limited by odd unit

From curve B, capacity is:

$$84.5\% \times 35{,}000 = 29{,}600 \text{ kva}$$

the limit being the 6,667-kva units

Load on the odd 10,000-kva unit is:

$$(29{,}600/43{,}000) \times 10{,}000 = 6{,}880 \text{ kva}$$

A slight increase in capacity can be secured at some sacrifice in voltage regulation by disconnecting the 6,667-kva units.

B—Consider two 10,000-kva units with impedance of 12% and three 6,667-kva units with impedance of 6%

Six-unit capacity is:

$$3 \times (6{,}667 + 5{,}000)^d = 35{,}000 \text{ kva}$$

And using:

$$(kva_2/kva_1) \times (Z_2/Z_1) = 0.75$$

From curve A, capacity is:

$$71.2\% \times 35{,}000 = 24{,}900 \text{ kva}$$

which is the maximum obtainable without a rearrangement of units.

---

[a] The 5,000-kva units will be half loaded when the parallel 10,000-kva units are fully loaded.

[b] Since the odd unit has the higher impedance, the value read from curve A is multiplied by the impedance ratio to determine capacity as limited by the odd unit loading.

[c] Since the odd unit has the higher impedance, the value read from curve A is multiplied by the impedance ratio to determine capacity as limited by the odd unit loading.

[d] The 10,000-kva units will be half loaded when the parallel 6,667-kva units are fully loaded.

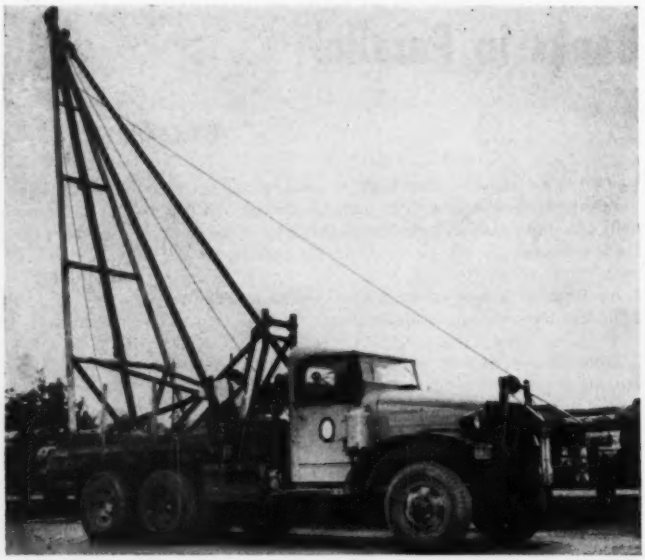
Flexible Steel Tubing Derrick Sets 90-ft Poles

F. E. REINHART
Construction Superintendent
California Electric Power Co
Riverside, Calif.

Poles up to 90 ft long are set safely on the California Electric Power Co system with a new derrick made of flexible steel tubing. The derrick was fabricated in company shops at a cost of about $1,000—a cost well repaid by additional safety it provides during setting of poles through energized overhead lines. The 3½ and 4-in. flexible tubing of which the derrick is made has sufficient elasticity to snap back into shape after sustaining heavy strains.

Total weight of the derrick is about 4,500 lb; it is mounted on a 6 x 6, 3-ton truck. Length of the double A-frame is 24 ft, with a telescoping section extending out to a total height of 43½ ft above ground. The double A-frame is hinged at the rear of the truck and erected by a line carried over a sheave and two rollers from a second winch at the front of the truck.

A safety feature on the truck is a limit switch which provides a warning against starting the truck motor while the winch is engaged. When the hoisting lever is in the engaged position, the switch completes a circuit from the ignition switch through a red warning light in the cab. The red light glows when the ignition is turned on, warning the driver to disengage the clutch lever before starting the motor.



FLEXIBLE STEEL TUBING makes a lightweight, strong and versatile derrick for California Electric Power Co. Telescoping extension reaches a total height of 43½ ft above ground. The derrick has been used to set poles up to 90 ft long

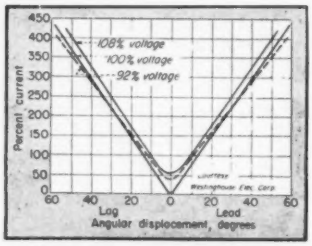
Voltage Blocking Relay for Automatic Synchronizing

G. C. BLEGEN
Bonneville Powerhouse Supt

R. B. BRUCK
Power Plant Design Branch
Corps of Engineers, Portland, Ore.

Field tests at Bonneville power plant have shown that synchronization of large hydro-generators with voltage differentials of 6% minus to 7.5% plus apparently cause negligible system disturbance. Only time any vibration occurred in the 54-Mw generators was when phase-angle was slightly off at the time of synchronizing.

Primary purpose of the tests was to determine under comparable conditions the adequacy of voltage-difference blocking relays to be used with automatic synchronizing equipment for McNary Dam power plant. The automatic equipment will synchronize generators to the low voltage delta bus of power transformers, which may or may not have other generators connected at the time. The voltage blocking relays will normally function to prevent closure of paralleling breakers if machine voltages are greater than approximately 5% plus or minus that of the bus.

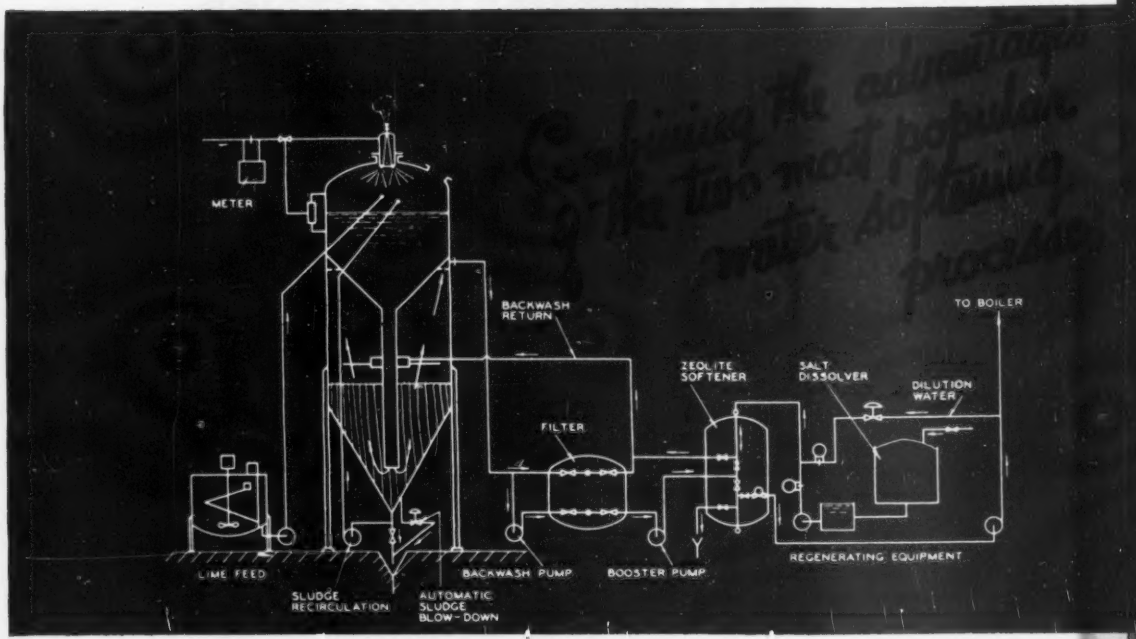


MINOR EFFECT of voltage differential compared to angular displacement at time of synchronizing hydro-generators is emphasized by curves of instantaneous symmetrical synchronizing currents for three incoming-to-system voltages

The Bonneville tests were made with one 54-Mw generator being paralleled with the transmission system through a transformer bank, and also paralleling with another generator of like capacity, connected to the system through a transformer bank. They showed conclusively that an accuracy of 5% plus or minus is sufficient to provide satisfactory automatic synchronizing of the larger machines.

Phase displacement is much more critical to system disturbance than voltage difference. Further studies by the Corps of Engineers indicate that: 1. A voltage difference of 8% causes circulating currents about 40% of

cochrane hot process zeolite water conditioner



1. saves chemicals
The zeolite softener uses salt instead of the more expensive soda ash and phosphates, bringing down the cost of chemicals considerably.

2. saves on capital investment The cost of adding zeolite equipment to a hot process installation is far less than the addition of an independent sedimentation tank and chemical feed for a two-stage phosphate process.

3. lower CO_2 in steam
The lower alkalinity resulting from using lime alone, plus the fact that this alkalinity is all carbonate, causes a reduction in CO_2 generated in the steam.

4. less operating attention The use of the zeolite softener with its simplicity of operation is an advantage which is enhanced by the longer periods between regenerations, due to the lower hardness of the hot process softener effluent.

5. less floor space and head room required
The addition of the zeolite equipment requires less floor space and less head room than that required for two stage phosphate equipment.

6. lower alkalinity The use of lime (or Dolomitic lime) as the sole reagent in the hot process means that the alkalinity can be reduced to about half that obtained with lime and soda ash.

7. only one chemical needed in the hot process It is generally possible to use a single reagent in the hot process, namely lime or Dolomitic lime, precipitating the bicarbonates and magnesium, leaving the remaining hardness to be removed by the more economical zeolite.

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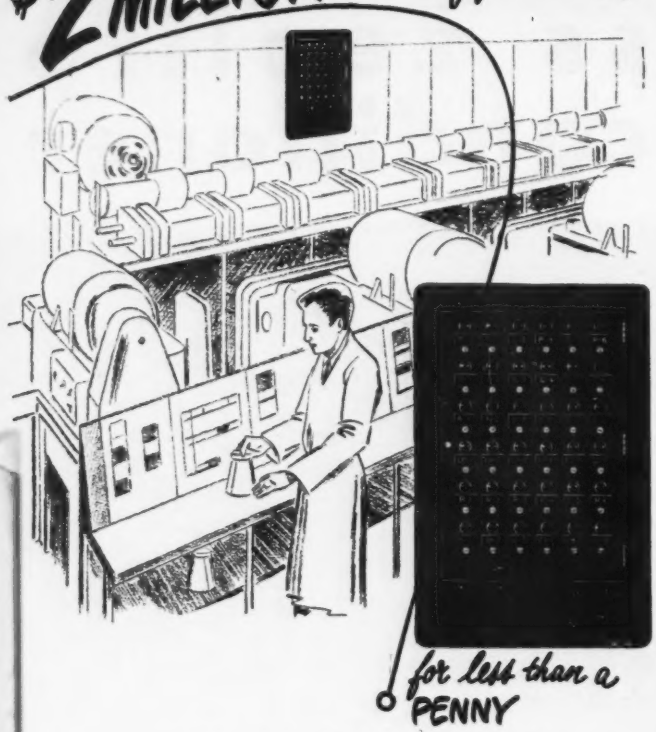

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PROTECT YOUR EQUIPMENT - - SPEED YOUR PROCESS - - SAVE YOUR PRODUCT by using

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SUPERVISORY ANNUNCIATORS

Here's how they work: when trouble occurs, a supervisory annunciator receives an electrical impulse from a normally open or normally closed, momentary or maintaining contactor, such as a thermostat, pressure or float switch. This impulse is converted in the annunciator circuit to a maintaining circuit that operates a visible signal indicating the source of trouble, and simultaneously sounds an audible alarm. Various operations sequences are available.

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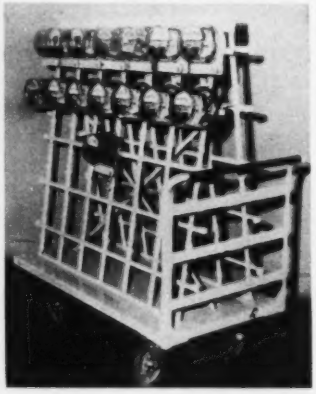
normal; 2. That a 1% difference in frequency causes a swing current not much larger than normal; 3. But that a phase displacement of only 15 deg causes a circulating current approximately equal to normal current of the machine.

Portable Meter Rack Accommodates 70 Meters

L. C. ENGLISH

Meter Superintendent
Virginia Electric Power Co
Alexandria, Va.

Inexpensively built, this portable meter rack will hold 70 socket or bottom-connected, single-phase meters. The rack is built on a 27 x 54-in. platform truck, and is equipped with 8-in.



PORTABLE METER RACK, with horizontal spacing of 8 in. and 9⅛-in. vertical spacing rides on platform truck

rubber-tired ball bearing casters. Rack is 1-in. box channel and 1 by ⅛-in. banding iron; meter supporting screws are size 12-24 by 1 in. A steel cap made of 14 gage sheet metal is used to support the upper ends of the box channel. Several of these portable racks are being used very satisfactorily in our meter department.

Handle Guy Wire Easily With Old Tire "Reel"

ORVAL WILKERSON

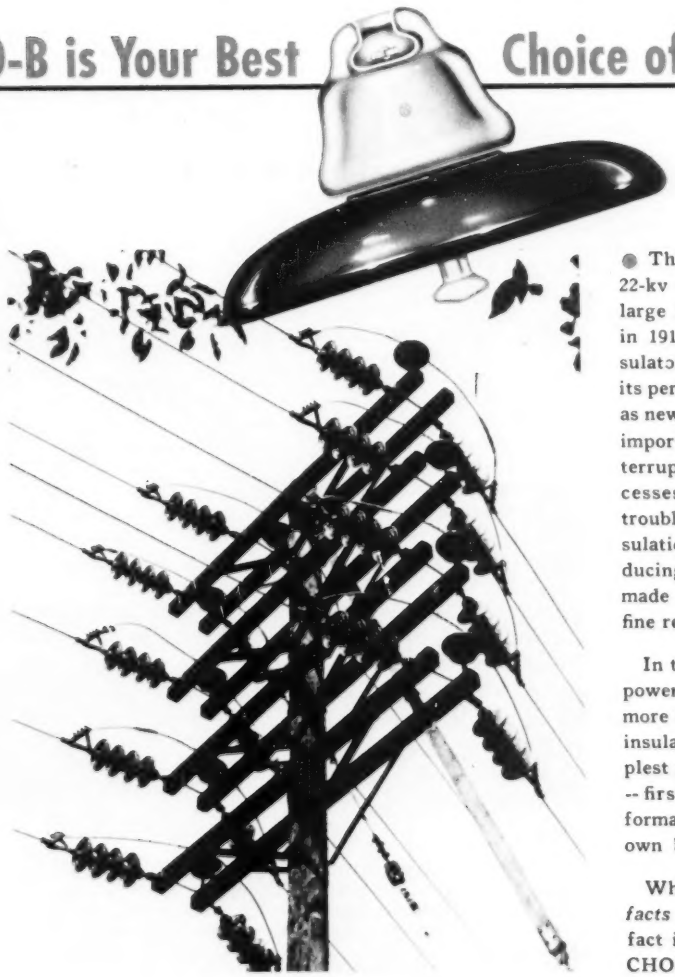
Oklahoma Gas & Electric Co
El Reno, Okla.

An old tire, modified as illustrated below, makes for easier handling of guy wire. The tire is cut through, and the bead cut off. Oblong slots in the sidewall anchor straps that hold

HI-TENSION NEWS *Junior*

WHEN YOU DEAL WITH FACTS

O-B is Your Best Choice of Insulators



● This deadend is part of a heavy 22-kv feeder system serving a large industrial city. It was built in 1919 with O-B suspension insulators. To date, 32 years later, its performance is labeled "as good as new." Since these lines all serve important, heavy loads, where interruptions to manufacturing processes might involve serious trouble and high cost, the O-B insulation has not only aided in producing steady revenue but has also made a definite contribution to fine relations.

In the intervening 32 years, this power company has built many more lines. OB has been chosen to insulate these lines for the simplest and best reason one can find -- firsthand experience and performance records in the company's own books.

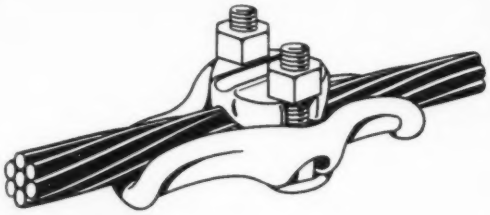
When arguments disappear and *facts* are brought out, one such fact is certain -- O-B is *your* best CHOICE OF INSULATORS.

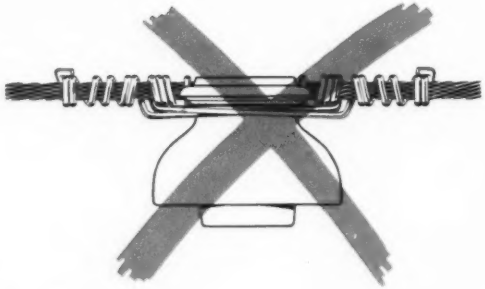
Ohio Brass

MANSFIELD, OHIO, U.S.A.

HI-TENSION NEWS *Junior*

A BETTER WAY





When five minutes or more of wasted lineman's time wasn't expensive, he could afford to tinker with a tie wire. When long or frequent line outages were an assumed part of operation, when repairs weren't costly, when there were no radio sets, when lines were never worked hot, a tie wire connection was good enough. But there had to be a better way of doing the job -- today it's done with O-B Clamptops.

Two quickly-tightened nuts, requiring only a common hand wrench, establish a connection between conductor and insulator, limited in slipless holding power only by the strength of the insulator and crossarm. Time, strain, or vibration don't depreciate this hold. Unbalanced loadings can't loosen the tie, then destroy the conductor by chafing. Loose ties can't cause radio interference. Dangerous energized free ends of tie wires can't whip into contact with structures or workmen during hot repairs. These are just a few things you get with the O-B Clamptop that supersedes the old tie.

Clamptop heads are available on most popular sizes of O-B conventional pintype and post insulators. Order a trial supply and see for yourself the real advancement that has been made by the modern O-B Clamptop.

DON'T CUT YOUR *Conductor*

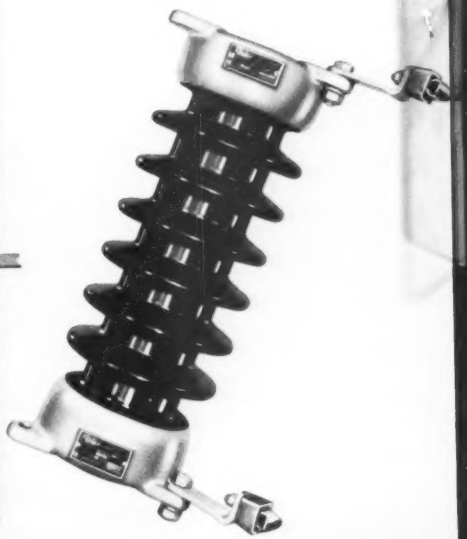
Power conductors don't have to be cut where jumper loops are formed at strain points -- in fact by not cutting them you avoid potential operating trouble and save construction cost as well . . . O-B Hi-Lite strain clamps attach to the continuous cable in a matter of minutes; take no more equipment than a common hand wrench; call for no special skill; develop full working strength of the cable; can be inspected for the life of the line to ascertain full holding power . . . Basically inexpensive, the O-B Hi-Lite strain clamp contributes to economy of labor, and to better line reliability by making possible the modern continuous jumper loop. Investigate this worth-while improvement.

HOW TO FIGURE A *Bargain*

Station insulator bargains aren't figured by the price tag -- they're figured by the calendar. You don't know *what* they cost until the last day of their life. On the surface, they look very much alike. National standards give them identical ratings . . . Competition keeps price in line. But, both standards and price apply only to the *first day* of the insulator's life, before it ever sees service. The permanence of rating and life-span -- the actual value -- is figured the *last day*. Thousands of engineers have discovered a real insulator bargain by investigating their own company records and specifying the station insulator that has done the best job for the longest time. This kind of intelligent bargain-seeking will point consistently to O-B.

More Protection- At No Premium

● Tolerance ratings of lightning arresters are *deducted* from their protective function -- they become a discount applied to nominal average values. The greater the tolerance, the greater the loss of protection . . . Have you carefully compared the O-B Thorex lightning arrester on the basis of tolerance? Here, briefly are the facts: *less than* +10 per cent sparkover and *less than* +5 per cent IR discharge voltage tolerances -- appreciably lower than any other arrester on the American market, and at no premium. For extra apparatus protection, specify the O-B Thorex.



Ohio Brass

MANSFIELD, OHIO, U.S.A.

B

HI-TENSION NEWS *Junior*

● Installed at the Ward Hill Substation of New England Electric System, Haverhill, Mass., this new Allis-Chalmers transformer reduces 115 kv from an incoming transmission circuit to the 23-kv station bus voltage. Some of the outstanding features of this equipment as pointed out by its manufacturer are . . . "15,000 kva capacity. Oil sealed inert gas system, pioneered by A-C 27 years ago and now standard on over 5,000,000 kva of power transformers. Combined expansion tank and relief device. Detachable radiators. Provision for future integral cooling fans. Rigidly braced and specially treated circular coils. No-load tap changer. Controlled gasket compression . . ." And O-B bushings --

One of the Finest Components of ANY Transformer

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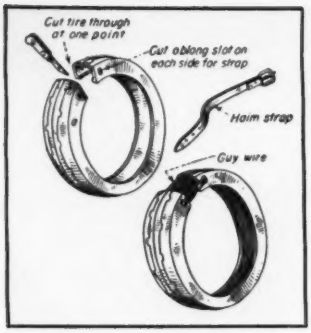
4126-H



GUY WIRE is easily coiled, stored, and transported in "old tire container"

the slit tire together. Guy wire coil is placed inside the tire and the straps fastened. This makes a convenient way of storing and transporting guy wire, and keeps it in good shape.

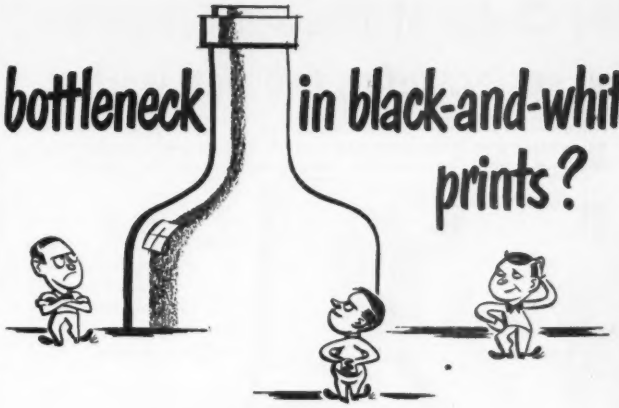
Penetrant Detects Flaws In Subsurface Metals

A new method for detecting surface flaws and their subsurface manifestations in metals has been devised by a west coast manufacturer. Called the dye penetrant method, it can check within 20 min any metal component of a motor or machinery without disassembly. The method can be used wherever a paint brush or spray gun can reach, or where dipping is possible. It eliminates use of electricity or bulky machinery required by standard testing schemes.

Works with Many Metals

Because its liquid components are portable, the dye penetrant method is applicable in field or shop. It detects flaws, crater cracks, lack of fusion and porosity in metal. The method works equally well on non-magnetic and magnetic metals, including plain and stainless steel, nickel and its alloys, magnesium, titanium, copper, brass, aluminum and its alloys, and cobalt. It will disclose welding flaws, cracks and internal trouble in precision machined parts and in plated parts.

Perfected by Northrop Aircraft, Inc, the method uses three basic solutions: A red-dyed penetrant; a solvent to clean the metal of penetrant; and a white, chalky developer, which "bleeds" the highly probing penerant from the metal's interior to the sur-



A modern Bruning BW machine will print up to 105 square feet per minute

The Bruning Model 93 BW machine makes prints up to 46 inches wide at speeds up to 30 feet a minute. Prints are fully developed, regardless of speed. They come out flat, dry, odorless, and ready for immediate use.

With such speed, it is possible to break bottlenecks in black-and-white prints, and still have capacity for other types of work.

- Duplicate tracings can be made on BW sensitized cloth or film—and changes or additions then made as desired with BW Eradicator Fluid and pen or pencil.
- Reports, records, correspondence and other paperwork can be copied in seconds and for pennies.
- Twenty different color combinations are available, and copies can be made on an unrivalled selection of card stocks, acetates, films and cloths as well as on papers of different weights and speeds.

Bruning BW machines do *not* use a vapor developer, hence emit no fumes, need no exhaust vents, no plumbing connections. They do not require a specially trained operator; *anyone* can easily operate a BW machine.

See for yourself what a Bruning BW copying machine will do for you. The coupon will provide you with a demonstration or with an explanatory booklet. No obligation. Send it today.

The Bruning Model 93, the finest black-and-white print machine made.

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☐ Please send me your free booklet A-1053A.
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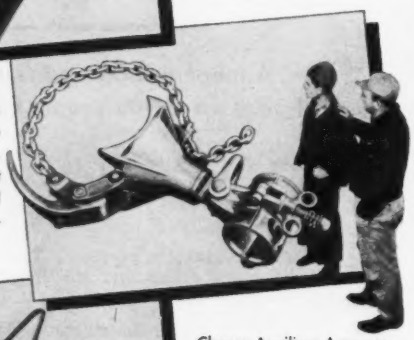
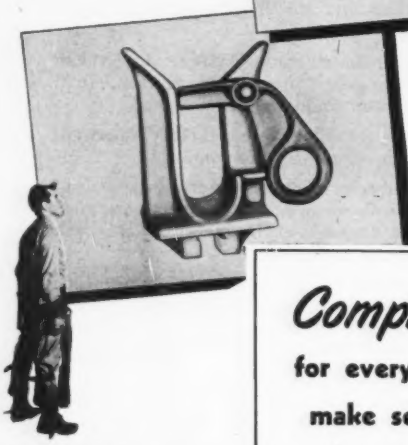
The Choice of Linemen Everywhere for *easier, safer,* live line work . . .

Ask the men who use them—they prefer Chance Hot Line Tools because heat-treated aluminum alloy fittings make them *lighter in weight*—easier to use. Features like those shown below make them faster in use, more versatile and reliable.

Chance Wire Tongs have wide jaws with smooth curved edges that hold any type of conductor without marring. They screw closed *fast* to speed application and lessen fatigue.



Chance Safety Locking Chain Tightener permits saddles to be applied quickly to poles. Saddles are light in weight—easily maneuverable—and are safe, strong and dependable.



Chance Auxiliary Arms are equipped with automatic latching wire holders to securely hold conductors. Conductors may be moved out and dropped into the wire holder without the aid of extra tools.

Complete Sets

for every type of job

make selection easy

and save you money!

This trailer protects tools from rain or snow, permits easy removal and replacement of tools, and is equipped with an electric heater to keep tools safely dry. Write for information, specifications, and prices.

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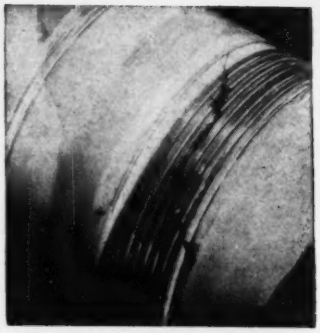


FISSURES in metal shaft are disclosed within 20 min by new dye penetrant method. Nature of subsurface flaw can be estimated accurately from appearance of penetrant. Method is applicable to over ten different kinds of metals

face. This developer, because it is white, supplies a suitable background against which the penetrant shows up with photographic intensity.

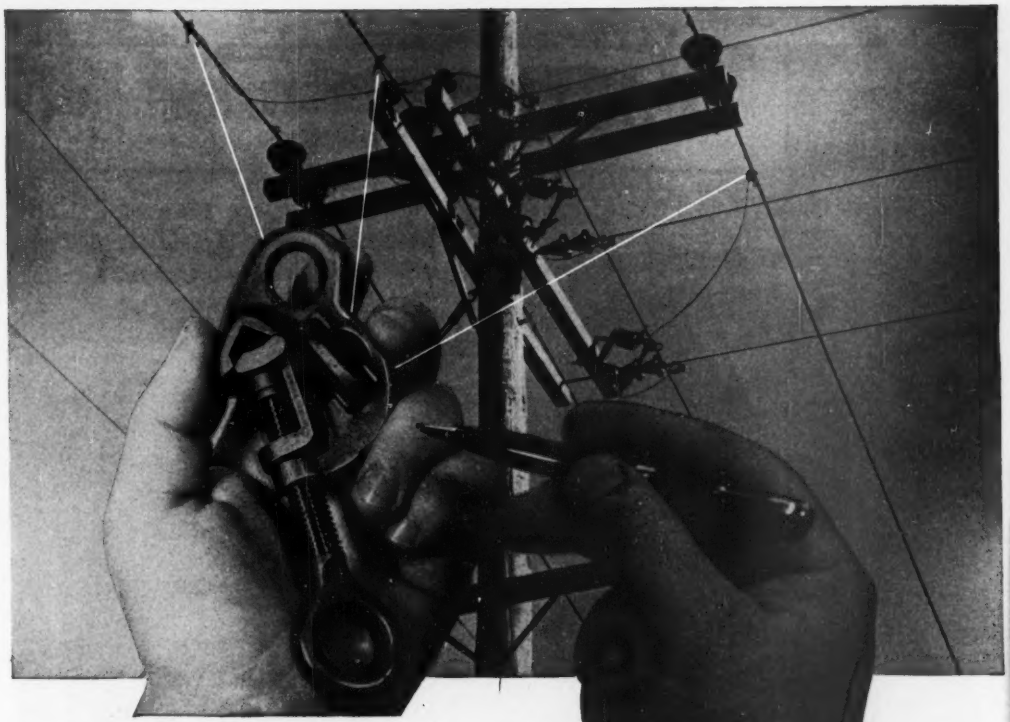
The red penetrant is a super-saturated solution, dyed so that the flaw can be interpreted more easily. By the size and shape of the surface indication, an accurate estimate can be made of the internal trouble and its extent. The "bleeding" is proportional to the depth and extent of the subsurface flaw.

Method of Application

Penetrant is applied to the clean metal surface and allowed to penetrate for from 5 to 15 min., depending on the metal and thinness (tightness) of the suspected flaw. Then, all penetrant is cleaned from the surface and developer is applied. The developer drys quickly, drawing the penetrant to its white surface. Tell-tale red flaws begin to show up immediately. Interpretation is not difficult. A red line indicates a crack or cold shut; a series of red dots in a line indicate a tight crack, cold shut, or partially welded lap. Indications are proportional to the nature of the flaw.

There are, however, some limitations. Only subsurface discontinuities which have surface flaws will show up by this method. Some grey iron castings are too porous to allow a proper reading because the penetrant flows easily through the natural pores of the metal.

The Dy-Check, Co, a subsidiary of Northrop, has been set up to market the solution in production and kit sizes.



the MOST IMPORTANT SPOT on the line deserves the BEST you can get

Chance Perma-Grip Clamps withstand surge currents — protect the conductor

When fault currents or heavy surges burn conductors, it invariably happens at the *point of contact* between main line and jumper—the most vulnerable spot on the line. This won't happen *if* the clamp makes sufficient contact with the conductor and if its current carrying capacity is greater than that of the jumper.

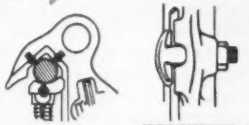
That's why it pays to *be extra selective* in the tap clamps you buy. *Put design and quality first.* Insist on Perma-Grip Clamps with THREE POINT CONTACT jaws that make better contacts on all wire sizes and that contact more strands on stranded conductor.

You will *also* get high *mechanical strength* combined with *high conductivity* — tap clamps with ability to withstand the torques necessary for good, tight applications and with stamina to hold indefinitely under strain—*plus* clamps that, regardless of size, have higher surge capacity or conductivity than the maximum jumper you can use with them. Perma-Grip bodies are cast of copper alloys or heat treated aluminum alloys selected to give you the *best possible combination of strength and conductivity.* U. S. S. threads screw up fast and hold tight with less tendency to freeze on the line when corrosion attacks.

Be sure you get the *best* for this important job—insist on the original Chance PERMA-GRIP Tap Clamps . . . proved in service for nearly twenty years.

Chance Perma-Grip Clamps are made for tapping to aluminum, copper, or steel conductors and are available in a complete range of sizes to meet all requirements.

Look for these features:



3 POINT CONTACT

HIGH PRESSURE JUMPER CONTACT

Guard the most important spot on your lines by using Genuine Chance Perma-Grip Clamps.

ABC INDUSTRIES

You know it's RIGHT when you specify CHANCE

A·B·CHANCE CO·

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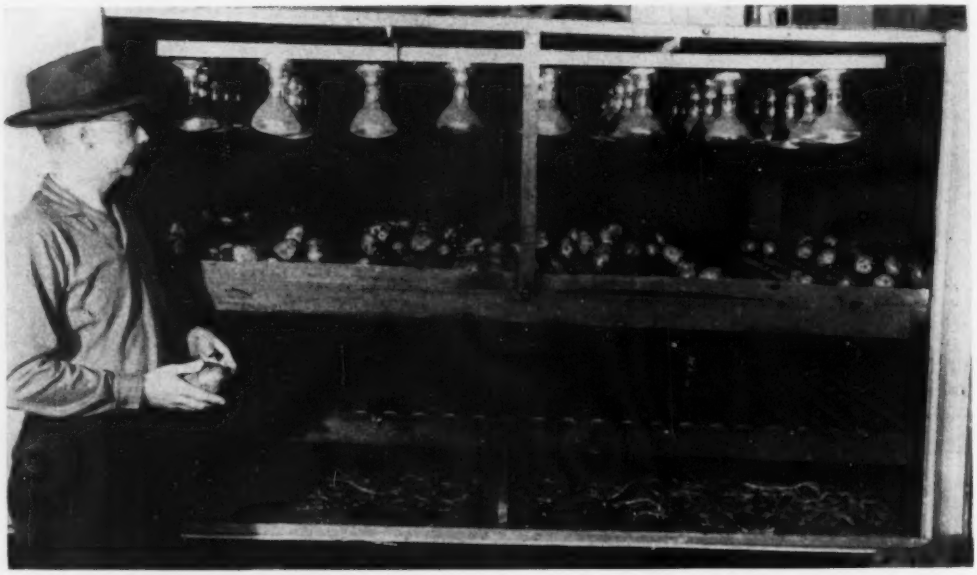


POTATO DRYING TUNNEL has bank of 50 infrared lamps, each rated 250 w, which serve as an auxiliary source of heat. Steam pipes furnish primary source. In addition, germicidal lamps are used to destroy any fungus or bacteria remaining on the potatoes. This plant processes from 3,200 to 6,000 bu of potatoes every day and uses about 10,000 kwhr per month

Infrared and Germicidal Lamps Aid In Potato Conditioning

H. E. RUCKS
Director of Lighting and Power Sales
Interstate Power Company
Dubuque, Iowa

Infrared and germicidal lamps have been used with remarkable success in the drying and conditioning of potatoes at Northern Valley Packing Corp, Hollandale, Minn. This company processes four to seven carloads —3,200 to 6,000 bu of potatoes every day. Storage capacity is more than 90,000 bu.

Before storing, potatoes are graded, washed, dried, and waxed. After grading they flow by gravity from storage bins through a system of water flumes running in and through the bins. They are then carried by water to the washing plant where more than 1,000 gal of water per min are run through the flumes to assure free movement and complete washing. From the washer they are conveyed to a water eliminator and from there to a waxer and then into a drying tunnel.

Infrared Auxiliary Heat

The drying tunnel is 35 ft long and is arranged as shown in the photo. Primary heating is by steam coils. Auxiliary heat is provided by 50 infrared heat lamps of 250 w each. Germicidal lamps are used to eliminate any fungus or bacteria remaining on the potatoes after the washing process.

Experience shows that these potatoes store better than those with much of the field dirt left on them. Shrinkage is reduced to a minimum by the washing and waxing process. The potatoes demand a premium price in the market because of their superior condition.

The washing process also uses 70 hp in motors. Freight cars are moved by an electrically operated low-speed winch.

Working season is 7½ to 8 mo a yr. The plant operates 8½ to 10 hr a day, six days a week, and uses approximately 10,000 kwhr per month.

Representatives of the Interstate Power Co worked with L. J. Christensen, manager of the plant, in the development of this potato conditioning process.

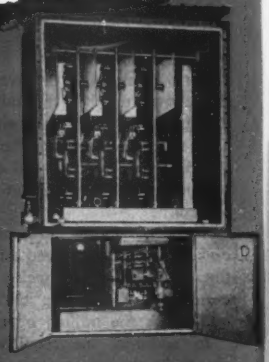
MOLONEY VOLTAGE REGULATING APPARATUS . . .
. . . THE ANSWER TO YOUR REGULATION PROBLEMS!

Moloney Step-Type Feeder Voltage Regulators, Regulating Transformers and Load Ratio Control Transformers have been chosen by many system engineers to solve their regulation problems after considering the following advantages of Moloney Load Tap Changer with which they are equipped.

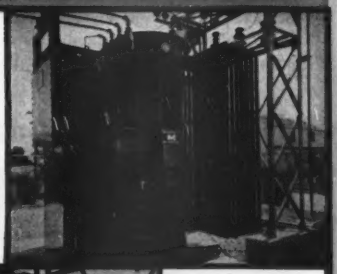
1. RELIABILITY . . . The tap selector switch is mechanically driven by Geneva gears to assure correct positioning. Arcing is prevented on this switch since the load transfer switch assumes the entire load before the selector switch contacts are opened and maintains this load till after the selector switch contacts close in the next tap position. The load transfer switch, which is the only switch required to transfer load current, is provided with accelerating springs and is driven by Geneva gears. This assures quick break of the current arc.

2. LOW MAINTENANCE COST . . . Contacts which transfer load current are accessible for inspection and maintenance through an access opening in the Load Tap Changer compartment cover. Arcing duty is imposed on only four stationary contact tips per phase as contrasted with eighteen in mechanisms performing both tap selection and load shifting duties on the same contacts.

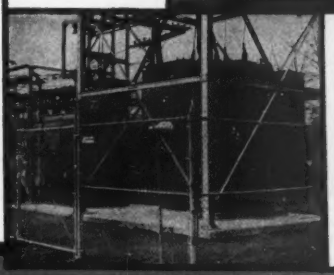
3. LOW LOSSES . . . The Moloney Load Tap Changer incorporates an ingenious method of by-passing the switching reactor to eliminate reactor copper losses. These losses are eliminated in all operating positions on 1¼% step apparatus and in half of the positions on ⅝% step apparatus.



Moloney three-phase Load Tap Changer with automatic controls. Tap assembly contains Tap Selector Switch, Load Transfer Switches and Reversing Switch. Motor drive and auxiliary equipment are at lower right. Automatic controls are at lower left. Moloney Automatic Control equipment features a super-sensitive voltage regulating relay and an electronic time delay circuit. A complete line of remote-manual and automatic controls and associated equipment is available.



Load Ratio Control Transformer rated 3000 Kva, 13200 volts Delta to 4330Y/2500 volts, equipped with automatically controlled Load Tap Changer.



Load Ratio Control Transformer rated 3000 Kva, 13500 volts Delta to 4330Y/2550. Load Tap Changer equipment provides plus or minus 10% regulation in 32-⅝% steps.

MOLONEY ELECTRIC COMPANY

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers • Step Voltage Regulators • Unit Substations

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

Adjustable-Speed Motor Aids Milling

An adjustable-speed motor has solved the problem of providing the many different and exact speeds required by a milling machine at the Judson Steel Corp plant, Oakland, California.

The machine is used to mill deformations on rolls used in a corrugating machine for processing concrete reinforcing bars. The hot metal passes under the rolls which form the familiar ridges or elevations found on these bars.

According to Judson engineers, the adjustable-speed a-c commutating motor has shortened the time required to prepare the rolls for bar processing. Deformations in the grooves vary in depth and number depending upon the size and type of bar being rolled. It is necessary to adjust the speed of the revolving cutting head constantly to suit the size of the deformation being cut.

With this motor it is possible to make such stepless speed adjustments (by brush shifting) quickly and accurately thus reducing the time required for the milling operation.

In addition, the required cutting speeds in the process are often difficult to determine in advance. When using belt-driven equipment, this necessitated prior calculations for belt length and wheel size. This problem has now been eliminated by this motor because it can be driven at any speed within its rating.

The motor is rated at 5/1.67 hp, 2,500/833 rpm, 440 v. A simple twist of the knob on top of the motor enables the operator to change speeds rapidly and with a high degree of accuracy.

General Electric Co photo

CORRUGATING MACHINE driven by adjustable-speed motor cuts concrete reinforcing bar processing time. Quick and accurate speed adjustments are made by simple twist of knob on top of motor

High Intensity Airport Approach Lights

HIGH INTENSITY APPROACH LIGHTS (in foreground) recently installed at Los Angeles International Airport look like this to a pilot who is making an approach at correct altitude and position. This is the Civil Aeronautics Administration's "Slope Line" system which not only penetrates extremely poor visibility conditions but also gives approaching pilot indication of correct altitude and position with respect to extended centerline of runway. System consists of two rows of lighting units extending 3,000 ft from the end of the instrument runway. There are 31 units in each row. Units are spaced 100-ft apart. Each unit is 14-ft long and has 10 sealed beam 200-w, 12.5-v lamps fed from a 2.5-kva 240/12.5-v dry type transformer. A 5-kva, 2,300/240-v transformer feeds each 2 units. Five degrees of brightness are available depending on visibility and are controllable from control tower

INDUSTRIAL BRIEFS

Automatic Electric Welding helps conserve serviceable parts, lowers reconditioning costs, and reduces parts shortages at the Peoria Tractor & Equipment Co, Peoria, Ill. Worn track rollers, idlers, carrier rollers, wear plates, cutting edges, bits, etc, can be very successfully restored to size in record time and at low cost using the submerged arc welding method. Twenty inches of weld per min can easily be accomplished. Welds are very uniform in width and depth of penetration as well as smooth in appearance. Caterpillar Tractor Co, Peoria, Ill.

SEND IN *YOUR* INDUSTRIAL BRIEF

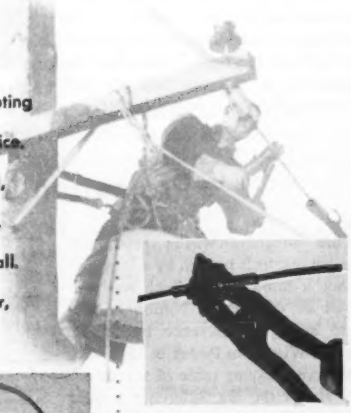
You'll get more satisfaction from knowing your item helped someone else than from the $5 you will be paid for each item accepted. Give us the basic facts covering the application; the name and location of user; benefits, advantages, and load characteristics of the application. Mail to: Industrial Briefs Editor, Electrical World, 330 W. 42 St., New York 18.

Maintenance and Service time for outdoor protective lighting units is considerably reduced by the use of disconnecting fixture hangers at the Ivanhoe Road Plant of The Perfection Stove Co, Cleveland, Ohio. Units are lowered for servicing and relamping at ground level thus eliminating climbing 25 ft ladders, made more hazardous by presence of automobiles and high fences around parking area. Since the lowered fixtures are "dead," there is no electrical hazard for maintenance workers. Thompson Electric Co, Cleveland, Ohio.

Abrasive Cloth Coating is accelerated tenfold with infrared radiant heaters at the Simonds Abrasive Co, Philadelphia, Pa. The former heat source permitted a maximum web speed of ¾ ft per min compared with 8 ft per min now attainable with the 27 in. wide cloth. Total installed capacity is 33.6 kw consisting of 24 230 v, 1,400-w heaters which are operated two in series on 460 v. Edwin L. Wiegand Co.

BURNDY- BUILT *to do an important job* BETTER

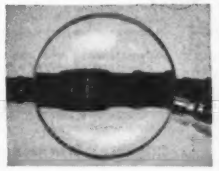
HYSPLICES... Overhead line splicing is expensive to do... expensive to do over. That's why so many utilities are now adopting the latest, most efficient line splicing method—the Burndy Hysplice. If you have not as yet, investigated the new Hysplice method, we urge you to call in the Burndy Representative for a brief, interesting demonstration. You will be under no obligation at all. Ask for Catalog HS51, listing tools, dies and sleeves for copper, copper weld, aluminum, A.C.S.R., Amerductor and steel.



Hysplicing speed and efficiency is the result of sensible tooling. Quickly, Hysplice sleeves are installed with a 9 lb. hydraulic Hypress that exerts a 9 ton force; illustration top of page. Simple manual tool (above) or foot, air and electrically operated tools can be supplied too.

BURNDY

HYSPLICE



The circular indents of the Hysplice provide a snubbing action on the cable. Under the indents, hard, high conductivity beryllium-copper particles are forced into the conductor and sleeve, keying the two together.

42 *Burndy, New York 54, N. Y. • Western Branch: Vernon 58, Calif. • Burndy Canada Ltd., Toronto 8, Ontario*

Plenty of Kwhr from Milk House Load

VIRGIL MARVIN
Toledo Edison Co
Toledo, Ohio

Approximately 5,000 kwhr of energy are used annually by milk house equipment on the Elgie Green Farm, West Unity, Ohio. In order to enter the fluid milk market with the output of the 20-cow herd a new milk house was constructed in 1950 to meet Grade A regulations for the area.

Dairymen visiting the farm are impressed by the numerous electrical features that make the care of milk and the cleaning of utensils easy and convenient for the operator. To provide comfortable working temperatures and to prevent freezing during the winter season four 250-w infrared heat lamps thermostatically controlled are mounted at ceiling height over the work area. In addition to the radiant heating load there are mechanical refrigeration to cool the milk and hot water supplied by a 30-gal heater.

RADIANT HEAT from thermostatically-controlled infrared lamps keeps farmer H. F. Bowers warm while he is working in his electrified milk house

Promotion Does Sell Adequate Wiring

That adequate wiring promotion does get results is proven by a four-city survey, a summary of which was presented at the recent National Adequate Wiring Conference by M. R. Norton, Wisconsin Power & Light Co. The accompanying table of survey results shows the big difference caused by vigorous promotion.

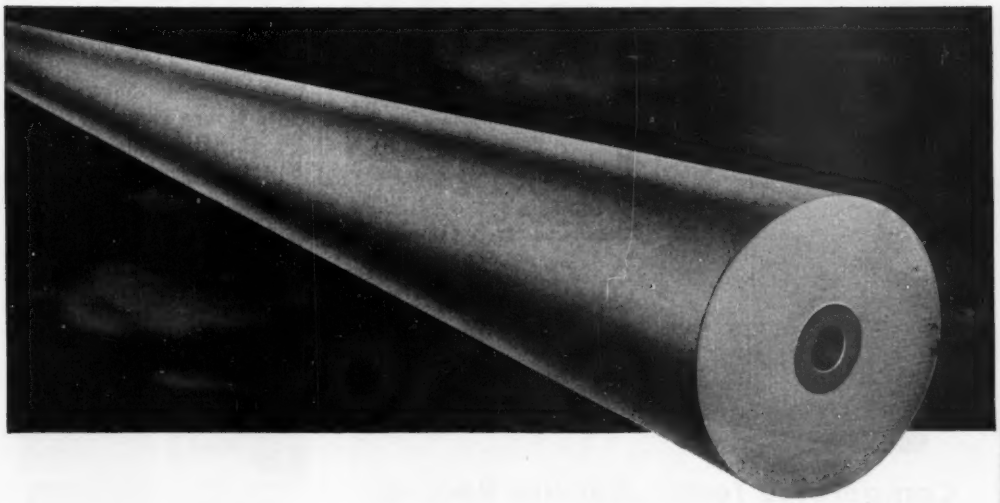
In making the survey, all homes in each city completed and connected in 1950 were visited. The checkers listed the sizes of entrance switches and conductors, and counted rooms, branch circuits and lighting, switch and convenience outlets. From these data the averages in the table were calculated.

In City "D," the only one of the four with an adequate wiring certification program, and vigorous promotion,

Comparison of Results from No, Some and Plenty of Adequate Wiring Promotion

	City A	City B	City C	City D	Certified Homes Only City "D"
1950 population	8,184	8,118	6,845	7,917	
Number homes built 1950	14	24	55	93	11
Average number rooms per home	5.46	5.04	4.96	4.74	5.65
Adequate wiring promotion in 1950					
Newspaper advertising by utility	None	1056 in.	172 in.	15 in.	
Number meetings on A/W for wiring contractors	None	2	None	1	
Attendance at consumer meetings on A/W	None	Some	100	Some	
Wiring refresher course for wiremen	No	Yes	No	Yes	
"Electricity in Building" magazine	No	No	No	Yes	
Certification program	No	No	No	Yes	
% Homes with larger than 6 entrance conductors	7.4	4.17	18.18	56.52	100
% Homes with larger than 60 amp entrance switches	14.8	4.17	23.64	56.52	100
Lighting circuits per home	2.93	3.98	4.35	4.57	5.18
Appliance circuits per home	1.21	.92	1.29	1.92	3.18
Special purpose circuits per home	1.07	1.00	1.75	2.69	3.36
Total Branch Circuits Per Home	5.21	5.90	7.39	9.18	11.72
Lighting outlets per home	15.64	17.83	20.04	20.78	27.45
Switches per home	12.65	14.75	15.11	18.17	22.18
Duplex convenience outlets per home	18.94	18.04	21.29	23.78	33.82
Total Outlets Per Home	47.23	50.62	56.44	62.73	83.45

a product of imagination . . .



. . . with an ideal combination of electrical and mechanical properties

By working alongside folks like yourself—at design desks, workbenches, and in laboratories—we've acquired a good idea of the time, care, and imagination you pour into the engineering and production of your products. The thick-skinned insulation tube for an expulsion fuse shown here is a good example. The manufacturer wanted moisture resistance, high strength, weather resistance *plus* excellent arc resistance—all wrapped up in a material that was easy to machine. Working with him, and using a little imagination, C-D engineers came up with *two* different plastics: Laminated Dilecto Tubing for the wall, and Vulcanized Fibre for the core.

It's another example of how you, too, can depend upon C-D to engineer the right laminated plastic for your needs. For C-D has no "axe to grind." We can recommend from five basic plastics subdivided into a remarkably wide range of grades and combinations of grades to supply almost *any combination* of mechanical, electrical, and chemical characteristics. For *this* kind of help and imagination, call your nearest C-D office, any time.

DE-4-50

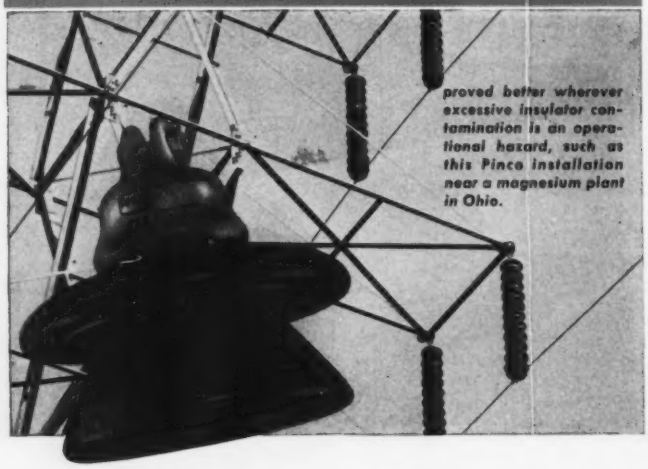
CELORON (Molded High-Strength Plastic)
MICABOND (Bonded Mica Splittings)
DIAMOND FIBRE (Vulcanized Fibre)
VULCOID (Resin Impregnated Fibre)
DILECTO (Laminated Thermosetting Plastic)

BRANCH OFFICES: NEW YORK 17 • CLEVELAND 14 • CHICAGO 11 • SPARTANBURG, S. C. • SALES OFFICES IN PRINCIPAL CITIES.
WEST COAST REPRESENTATIVE: MARWOOD LTD., SAN FRANCISCO 3 • IN CANADA: DIAMOND STATE FIBRE CO. OF CANADA, LTD., TORONTO 8

Continental-Diamond FIBRE COMPANY

Established 1895 . . . Manufacturers of Laminated Plastics since 1911 — NEWARK 15 DELAWARE

RIGHT for the JOB . . . RIGHT ON THE JOB!



proved better wherever excessive insulator contamination is an operational hazard, such as this Pinco installation near a magnesium plant in Ohio.

Competitive Tests...Service Records Prove the Superiority of PINCO L1612 "Universal" Insulators

In competitive "fog operation" tests conducted by a Western power company, Pinco L1612 Insulators rated . . .

FIRST on "fog arc over."

FIRST on sustained voltage "in fog" . . . NO arc over.

FIRST on sustained voltage "in direct spray" . . . NO arc over.

FIRST on both self-cleaning and manual cleaning characteristics.

SECOND on "sluice arc over."

EXCELLENT on radio interference characteristics.

We're proud that Pinco Insulators were so conclusively proved "right" by such laboratory tests. But we're even more proud to know that in actual operation under "fog" conditions, thousands of Pinco L1612's have been meeting their job requirements 100% on installations *made eighteen years ago!* Such a record of trouble-free service proves that they're "right" where it counts . . . "right on the job!" So when you have a tough job for insulators calling for L1612 characteristics . . . put up Pinco *to be sure!*

See Page 70, Pinco Catalog No. 49 for complete electrical and mechanical characteristics.

The Porcelain Insulator Corporation

761 Main St., Lima, N. Y.

Sales Agents: JOSLYN MFG. & SUPPLY CO.

Offices in Principal Cities

PINCO INSULATORS

Suspension Insulators . . . Switch and Bus Insulators . . . Distribution Clamps . . . Distribution Pin Types and Guy Strains . . . Transmission Line Fittings . . . Tree Insulators . . . Transformer and Circuit Breaker Bushings . . . One Piece and Multi-part High Voltage Pin Types . . . Suspension and Strain Clamps . . . Indoor Bus Support Porcelain . . . Lightning Arrester Porcelain

the proportion of large entrances and the numbers of circuits and outlets is impressively larger than in the others. And the comparison is much more striking when only the certified homes in city "D" are considered. That some promotion, less than all-out, also gets results is shown by the data for cities "B" and "C."

Gate House Heating Costs Cut With Electric Heat

The installation of electric heating in the all-glass gate house at the Wright Aeronautical Corp, Wood-Ridge, N. J., saved an estimated $2,050 over a steam heating system originally planned for this house. The three electric heating units installed include a 3-kw unit heater, a 2.5-kw electric-steam radiator and a 4-kw strip heater. They keep the gate house at a comfortable 70 F with zero weather outside.

ALL-ELECTRIC HEATING system for all-glass gate house cuts installation, operating and maintenance costs over proposed steam heating system. Connected load of unit heater, electric-steam radiator and strip heater (not shown in picture) is 9.5-kw

Canadian Utility Revises Advertising Allowance

With a view to encouraging increased promotion on appliances which require more sales effort to gain public acceptance, the British Columbia Electric Co early this year announced changes in the advertising allowances available to dealers who cooperate by reporting appliance sales. Previously, the allowance had been ½ of 1% of reported sales, paid in

Combines All Four

EVERY requisite that sound construction needs demand are combined in *Crapo* Galvanized Steel Strand—

1. High strength
2. Ruggedness
3. Long life
4. Economy

The superior tensile strength inherent in steel is utilized to fullest advantage in each size and grade of this time-proved strand. The heavy, ductile, tightly-adherent galvanized coating—applied by the famous *Crapo* process—provides dependable protection to the steel, extends the life of the strand beyond the normal period of replacement.

Specify *Crapo* Galvanized Steel Strand for guys, messenger and overhead ground wires! There is a size and grade for every practical need available for prompt shipment.

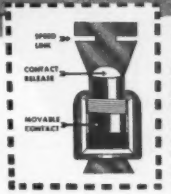
ASK YOUR JOBBER!

Consult your nearest distributor of *Crapo* Products or write direct for further information!

INDIANA STEEL & WIRE CO.
MUNCIE INDIANA

how to keep hot circuits cool

Trion



HOW IT WORKS

A short circuit blows speed link instantly. Therm-A-Trip (matched to thermal capacity of the motor or transformer it protects) also opens circuit when safe surrounding or load temperatures are exceeded. Provides adequate protection with extra long time delay.

DUAL ELEMENT TRIPLE PROTECTION FUSE WITH THERM-A-TRIP

Trion — THE THREE-IN-ONE FUSE

TRION is the coolest operating fuse of any type.
TRION gives instantaneous cut-off on short circuit.
TRION controls rate of rise of recovery voltage.
TRION has longest safe time-lag of any overload protective device.
TRION's time-delay averages five times longer than any renewable or one-time fuse.
TRION starts heavily loaded motors safely.
TRION protects against single phasing.
TRION's watt (power) loss is substantially lower.
TRION's tripping temperature provides a heat ceiling 500° F. lower than any zinc link fuse.
TRION reduces and controls the heating of switches and fuse clips.
TRION permits the use of switches of lower rating.
TRION keeps hot circuits cool.

A TRION FOR EVERY CIRCUIT

Trions are available in 141 Standard Sizes ranging from 1 to 600 amps for both 250 and 600 Volt circuits. Other sizes for these same voltages range from 1/10 amp to 9 amps. Midget Sizes (3/4" dia. by 1 1/2" long) vary from 1/10 amp to 10 amps. **ASK FOR TRION OR WRITE FOR FREE TRION BULLETIN #506-A TODAY.**

"Look to Shawmut for leadership"

THE CHASE-SHAWMUT CO.
370 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

The Old Reliable

EVERSTICK ANCHORS...

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life

● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all others. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE
EVERSTICK
FEATURE
Exclusive Everstick nut housing. Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO.
Manufacturer of "THE ANCHOR OF MERIT"
FAIRFIELD, IOWA

cash on receipt of report. The new allowance is the total of bonuses on unit sales, with a minimum of $1.00 for a report that lists no bonus sales. Bonuses range from a high of $5 for a clothes dryer sale to a low of 50¢ for an electric bed covering, according to the following list:

Appliance	Unit Bonus
Electric Range	$1.00
Gas Range	1.50
Electric Water Heater	1.00
Gas Water Heater	1.50
Home Freezer	1.00
Electric Dishwasher	2.50
Electric Waste Disposer	2.50
Ironer	1.00
Electric Clothes Dryer	5.00
Gas Clothes Dryer	5.00
Electric Bedding (Blankets, etc.)	.50
Minimum for sales report listing none of above items sold	1.00

From time to time the activity or lack of activity on some appliances, shown on the reports received, may point out the necessity for changes in the bonus setup. For the appliances listed, except electric bedding, the dealer is required to report each sale by description of appliance—make, model, style, etc—buyer's name, address at which the appliance will be used, and cash selling price. Sales of bedding and other appliances are reported only in total units and value.

Sales and Service Notes

● Fluorescent sun lamps increase egg output, asserted Richard Sheetz, Westinghouse, at the 1950 national convention of the American Society of Agricultural Engineers. With all conditions of feeding and environment the same except that one of the two pens included the sun lamps, a test was made for 18 days. In the pen with the lamps, 12.4 eggs per hen were produced and in the other only 9.7.

● Farm electrification researchers at the University of Idaho are exploring five fields: High-frequency drying, particularly seeds; nose branding of sheep; removal of tramp iron from feeds; infrared chicken brooding; electrically operated fence gates.

● Hose drying time for the Bloomfield, Conn, Fire Co is speeded up by a circulation cabinet in the engine house. A 15-in. fan changes the air four to six times per minute, drying 500 ft of hose (in 10 50-ft rolls) in 24 hrs during warm weather or in 12 hrs when strip heaters are turned on. The heater units total 13.5 amps at 220 v. Before this installation was made, drying hose was a matter of several days, depending on the weather.

Liked Their Work, Now Like It Better

BOOKKEEPERS in the foreground of this picture average more than 25 years of service with Jersey Central Power & Light Co. Evidently they liked the place where they worked. They like it even better now, since the office lighting was modernized. On the tops of the safe-file desks is an intensity of 90 ft-c. High reflection factors of the accoustical tile ceiling (85%), the two-tone pastel green walls (70%) and light linoleum floor (70%), contribute much to good seeing conditions

INSULATED AGAINST *DOWN-TIME**

To help insure efficient operation with a minimum of costly "down-time," this giant 100,000-kw generator at Toledo Edison's Acme Plant is protected with Fiberglas† glass-base insulating materials.

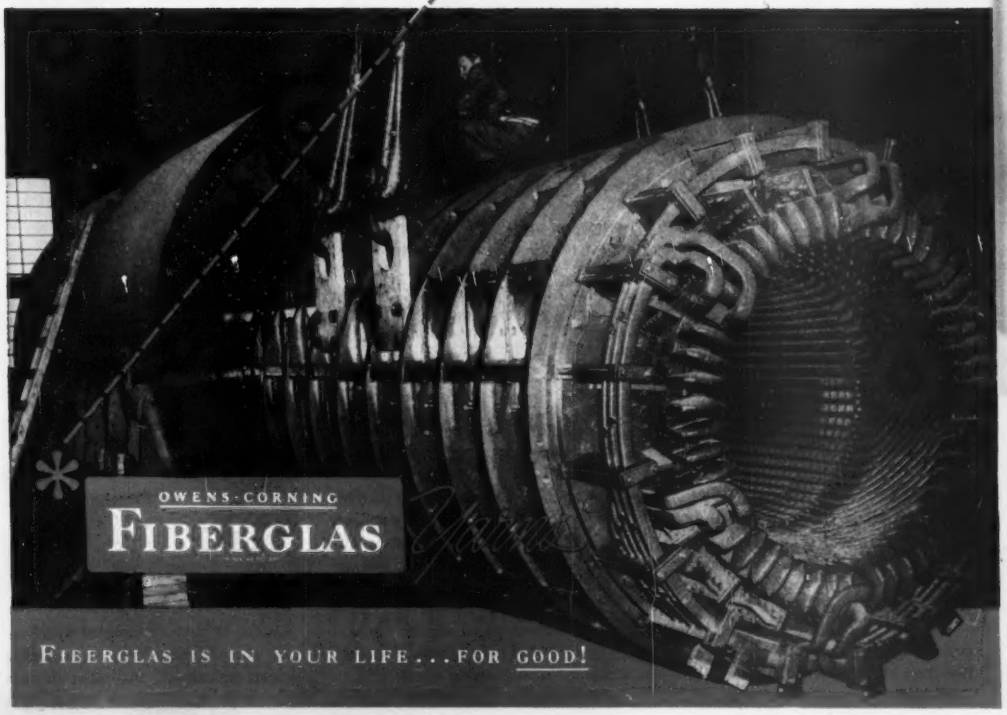
Now, when electric power must be supplied at constant high rates to maintain production for military as well as civilian needs, the superior qualities of Fiberglas insulations are needed more than ever.

High strength with small diameter, plus resistance to heat, moisture, rot, corrosion, and age, are just a few of the unique properties that make Fiberglas yarns ideal for virtually any type of electrical insulation.

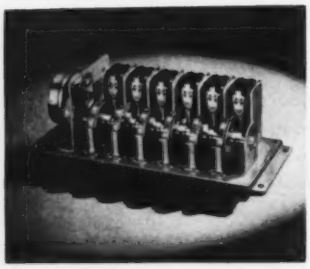
Because of increasing military demands for Fiberglas yarns, manufacturers are often unable to get all they need. We are building new facilities to help meet these demands.

Write today for your copy of the 32-page book describing the many uses of Fiberglas materials in electrical insulation. Owens-Corning Fiberglas Corporation, Electrical Sales Division, Dept. 858, 16 E. 56th Street, New York 22, N. Y.

†Fiberglas is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with fibrous glass.



NEW EQUIPMENT



Recycling Timer

This multi-cam timer offers a means for controlling manufacturing and processing operations. Since all cams are mounted on a common shaft, a common time cycle is assured for all circuits. Each cam, calibrated in percent, is independently adjustable for ON and OFF electrical periods ranging from 2% to 98% of the time cycle.

Nine models are available, with cycles ranging from one revolution in 40 sec to one revolution in 72 hours.

Industrial Timer Corp, Newark, N. J.

•

Chain Saw

Powered by a 4 hp gasoline engine, this saw can be operated by one man. Automatic clutch prevents overload when the chain binds in cut. Built-in engine governor prevents racing when saw is out of cut. Concentric-bowl carburetor permits operation at extreme angles.

Blade sizes ranging from an 18 in. one-man straight blade to a 42 in. two-man straight blade are available.

Homelite Corp, Port Chester, N. Y.

Synchronization Pickup

Designed to study pressure, stress, displacement, and similar phenomena with a cathode-ray oscillograph this pickup supplies a pulse to trigger the sweep of the oscillograph when a small piece of steel is moved past the face of the pole piece. Type 140 Pickup will trigger the DuMont 304-H Cathode-ray Oscillograph from rotary speeds of 70 RPM and linear speeds of 15 in. per sec.

Sterling Instruments Co, 13331 Linwood Ave, Detroit 6, Mich.

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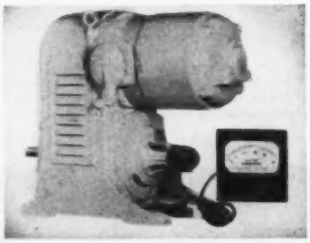

Tachometer

Available on U. S. Varidrive motors, model R-1 tachometer indicates operating speed as a percentage of maximum speed. Requiring no external source of power, indicator can be mounted at distances up to 300 ft without affecting accuracy.

U. S. Electric Motors Inc, 200 East Slauson Ave, Los Angeles 54, Calif.

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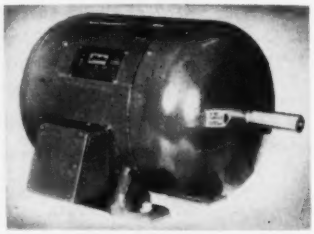
Control Panel

The latest Regulex generator voltage regulator development is a control panel which has no moving parts or electron tubes.

Consisting of compensating unit for reactive current division, stabilizer panel, static voltage measuring circuit, battery excitation switch and resistor, and a damping transformer, this static regulating equipment is built in standardized panel sections which can be mounted either in a convenient cubicle or in switchgear units.

Allis-Chalmers, Milwaukee 1, Wis.



Splashproof Motors

Splashproof motors have been designed for food industry applications where splashing or hosing down exceeds NEMA standards for splashproofing.

These motors incorporate gasketed cast iron conduit boxes with provision for attaching waterproof conduit. Motor windings are given multiple dips and bakes in moisture-resistant thermoset varnish. Baffles inside the rear splashproof hood prevent water creeping up inside the hood. These motors are available in frames 326 and smaller, and use pre-lubricated ball bearings.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

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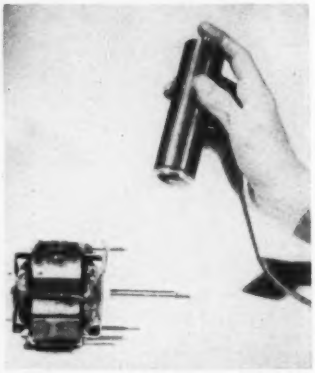


Stroboscope

Useful in the servicing of synchronous motors, time switches, timing devices, generators, and other devices that utilize synchronous speeds this

out of sight out of mind

Hubbard-Copperweld Ground Rods LAST... and LAST... and LAST...

Clamps may be had with safety set screw as shown, or with square bolt head.

Cross section of a ½-inch Copperweld Ground Rod showing approximate proportion of copper and steel.

Installed underground, out of sight, for years and years to come. Out of mind, too; no more worries about protection. Periodic tests can be made quickly, easily.

Hubbard-Copperweld Ground Rods combine the strength of alloy steel with the permanent corrosion resistance of copper. The permanent Molten-Weld completely eliminates the possibility of harmful electro-galvanic action within the rod. There are no microscopic cracks, fissures, or pin holes in the thick copper exterior. They offer assured protection when installed to a sufficient depth to reach permanent moisture.

The time-tested dependability and economy of Hubbard-Copperweld Ground Rods have been proved in service for 35 years. They offer permanent grounding protection at lowest annual cost. They come in diameters from ⅜ to 1-inch and in lengths from 5 to 40 feet.

HUBBARD AND COMPANY

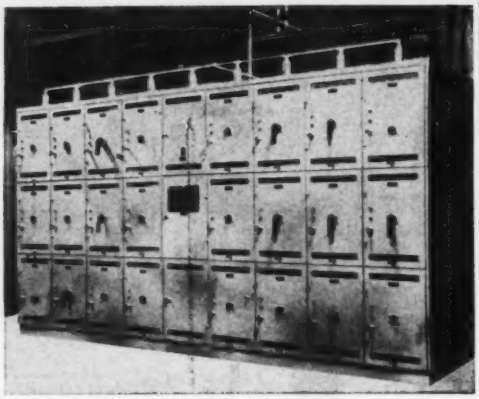
ESTABLISHED 1842

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the load on Hubbard Hardware!"

Round-the-Clock Fire Watchman

NOW ON DUTY



IN SWITCHGEAR CUBICLES OF LEADING SOUTHERN GENERATING STATION

Fire, even a small one, in generating station switchgear cubicles can short circuit distribution facilities...create unwarranted loss of voltage . . . destroy essential equipment.

That's why a leading southern power company recently installed, in one of its generating stations, modern, approved C-O-TWO fire protection.

Four automatic fire extinguishing systems were installed to protect the various switchgear cubicles from that inevitable, destructive enemy . . . fire. If fire should strike, quick-acting, clean, non-damaging, non-conducting carbon dioxide blankets the stricken area and extinguishes the blaze in seconds before it spreads and causes extensive damage. There is no after fire mess to clean up, no lingering odors, no water damage with carbon dioxide.

C-O-TWO offers complete carbon dioxide type fire extinguishing equipment . . . hand portables, wheeled portables, hose units, high pressure cylinder systems and low pressure storage tank systems; plus smoke and heat fire detecting systems and dry chemical type fire extinguishers . . . all render fast, positive action against fire.

So, whatever your fire protection problem, let an expert C-O-TWO Fire Protection Engineer help you in planning complete and up-to-date fire protection facilities now. Write us today . . . tell us about your particular fire hazards, our experience is at your disposal. There is no obligation to you of course.

C-O-TWO

C-O-TWO FIRE EQUIPMENT COMPANY

NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

Affiliated with Pyrene Manufacturing Company

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers • Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

unit gives off a pulse of light during positive portion of the ac cycle.

This visible pulse stoboscopically stops motion that is in synchronism with line frequency.

The Synchroscope Co, 57 William St, New York 5, N. Y.

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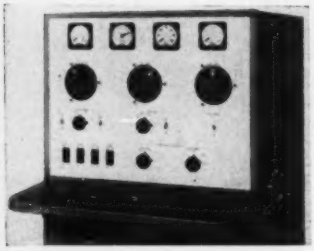

Demand Meter Test Unit

Thermal demand meters can be tested with a new unit furnishing an adjustable supply of steady voltage, steady current, and a means for adjusting the phase angle and holding it constant. Other uses include overnight gang testing of watthour meter register ratios, network relays, or other devices where phase angle is of importance.

The 500-va rating of the potential circuit and the 1,000-va rating of the current circuit is reported sufficient to test 30 single-phase thermal demand meters, on a conservative rating, and several hundred watthour meters. The unit operates on a 208 or 240-v 3-phase supply.

Eastern Specialty Co, 3617 North Eighth St, Philadelphia 40, Pa.

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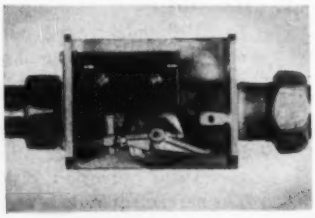
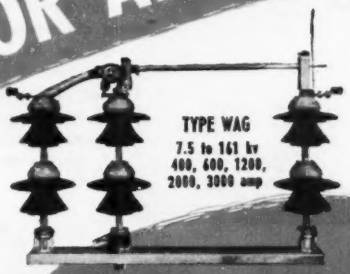


Flow Interlock

A newly designed flow interlock includes a finer differential, union fittings at both ends, a bronze piston, reduced size and weight, simpler adjustment, and more wiring space. The interlock closes a contact when a flow of water exceeds a preset amount and opens it when the flow falls below the preset amount. Operation depends

Air Break Switches FOR ANY APPLICATION

from rural line to generating station

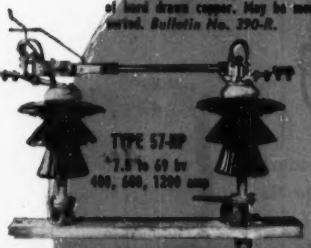


TYPE WAG
7.5 to 161 kv
400, 600, 1200, 2000, 3000 amp

High pressure, vertical break switch. Rotating blade principle applies extremely high contact pressure. Only four moving elements. Operates easily under all conditions. Single tube blade of hard drawn copper. May be mounted upright, vertical or inverted. *Bulletin No. 390-R.*

TYPE 110
34.5 to 161 kv
400, 600, 1200 amp

High pressure, center break switch, both insulators rotating. Particularly applicable where space is limited. Requires no counterbalancing. Self-cleaning contacts of high conductivity, wear resistant metal. May be mounted upright, vertical or inverted. *Bulletin No. 360-50.*

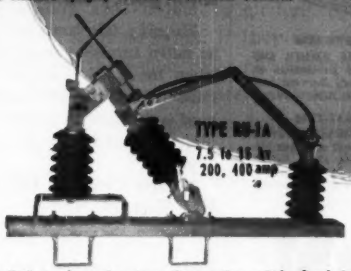


TYPE 57-HP
7.5 to 69 kv
400, 600, 1200 amp

High pressure, side break switch, one insulator rotating. High contact pressure, wide deflection assures long operation without critical adjustment. Designed so any ice formation will be in shear. May be mounted upright, vertical or inverted. *Bulletin No. 365HP.*

TYPE TR-1A
7.5 to 69 kv
200, 400, 600 amp

Tilting insulator disconnecting switch, three insulators per pole. Particularly adaptable for pole top application. Fast, economical installation. Adjustment and control alignment simple and positive. Shunts of more than adequate capacity tinned to resist deterioration. (Type TR-6A, two insulators per pole, available). *Bulletin No. 3050.*



TYPE RU-1A
7.5 to 15 kv
200, 400 amp

Vertical break, rocker type disconnecting switch. Rural type insulators. Temperature rating and open gap meets NEMA standards. Features installation ease, constant contact pressure with full wiping action. Economical to install and maintain. (Type RU-6A, two insulators per pole, available). *Bulletin No. 264-R.*

Southern States' major types of air break, group operated switches are made in a complete range of capacities for all normal installations. Five basic designs enable you to choose a switch with the exact operating characteristics for top performance.

Each of Southern States' air break switches is the result of years of research, design, test and improvement. Tests for temperature rise, high current, dielectic, icing and operation plus many years of service in the field have proven the reliability of SS switches under all operating conditions.

High quality throughout this entire line means better equipment for your investment with the assurance that you are getting maximum benefits of dependability, economy and low maintenance.

Southern States Equipment Corp.
HAMPTON GEORGIA

IT will help you cut tower painting cost!

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PARTIAL LIST OF CONTENTS

- Tower painting practices
- Analysis of cost elements
- Computed painting costs for various tower weights and surface areas
- Economics of transmission tower painting
- Formulas for computing costs

DIXON 2-COAT SYSTEM

Use **DIXON SILICA GRAPHITE PRIMER AND PAINT** for *maximum* tower protection at *lowest* annual painting cost. Service records of from 7 to 16 years not unusual.

DIXON 1-COAT SYSTEM

Use **DIXON ONE-COAT TRANSMISSION TOWER GRAY PAINT** where initial cost or other requirements dictate the use of a 1-coat application. Ask for test report on remarkable enduring qualities of this paint.

MAIL COUPON BELOW for your free copy of this new and timely engineering manual. Contains valuable data never published before.

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SPECIALISTS IN OUTDOOR PAINTS FOR METALS — FOR ALMOST A CENTURY

JOSEPH DIXON CRUCIBLE COMPANY, Paint Division, Jersey City 3, N. J., Dep't. 5E

Without obligation please send me ☐ Copy of your new engineering manual "Transmission Tower Painting" ☐ Copy of U.S. Testing Company report on test of one-coat tower paints ☐ Have your representative call on me.

COMPANY_____

ADDRESS_____

NAME_____ TITLE_____

upon the amount of flow and is independent of the pressure.

It can be used as a safety device in hot water heaters, welding units, transformer cooling, induction heating etc. One screw adjustment sets the circuit for any flow from ½ gpm to 4 gpm. Flow differential between cut-in and cut-out of the electrical contact is 0.1 gal max. Electrical rating is 10 amp at 120 or 240-v ac. Maximum permissible pressure is 125 psi.

General Electric Co, Apparatus Dept, Schenectady 5, N. Y.

•

Emergency Lamp

Plugging this lamp into any 110-v ac outlet furnishes emergency lighting when the regular source of current fails. The adjustable 21 cp flood type head is designed to fit a 7½-v battery. Manual operation as a hand lamp is possible.

Electric Cord Co, 195 William St, New York 38, N. Y.

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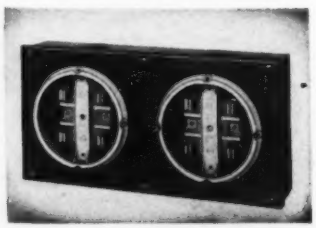
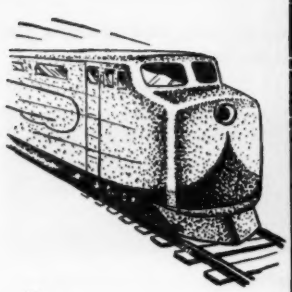


Socket Meter Troughs

Accommodating up to six jaws these sockets are rated at 100 amp. The one piece porcelain base is floated to reduce breakage and to provide automatic alignment of the jaws. Extra



REACHING OUT 20 MILES TO LEAD A TRAIN

Railroad signal and communication engineers require dependability above all other things in the equipment which they buy. When it comes to signal cables, which are the vital connecting links between control machines and signals, they have a serious problem. If the cables are installed in the air they are subject to cinders, sparks, heat, sunlight, sleet and rain. If they are installed underground, the cables must be able to withstand long-time exposure to water, soil acids and alkalies, vibration from passing trains, and the cutting effect of sharp cinders. This is brutal punishment. So how to get trains through safely and on time — not once, but every day in the year?

Fortunately, long before the railroads started to use CTC (Centralized Traffic Control) Simplex had developed an insulation that had excellent properties for signal and communication work and was dependably water resistant. That solved the moisture problem. The use of especially compounded neoprene as a jacketing material solved the problem of how to combat sparks, heat, sunlight, rain, etc. This is a typical example of how Simplex Research helps to provide just the right cable for the job.

Simplex Research gave you the first heavy duty, rubber-jacketed portable cord or cable; the first low water absorption insulation; the first rubber-jacketed underground cable. Besides these notable "Firsts" Simplex Research has provided a great many developments which have enriched the art of cable design.

SIMPLEX-ANHYDREX IS A PRODUCT OF SIMPLEX RESEARCH

SIMPLEX-ANHYDREX

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

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Look to the West for transmission and telephone poles... To western Montana, where much of America's finest virgin timber is located...To the J. Neils Lumber Company plant at Libby.

Long a quality manufacturer of forest products (since 1895) J. Neils is a major producer of power and telephone poles.

At Libby, Montana, in the heart of a great forest empire, J. Neils manufactures and treats the poles that come from magnificent stands of Western Larch, Lodgepole Pine and Douglas Fir. This modern pole treating plant measures up to the highest quality standards in men, materials, equipment and methods.

An illustrated folder on J. Neils treated poles, and information regarding their application to your requirements, will be furnished gladly on request.

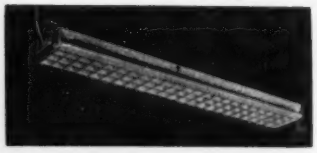
J N *J. Neils Lumber Company*

Pole Division: LIBBY, MONTANA

jaws can be added conveniently in the field, eliminating the need for special stocks.

Square D Co, 6060 Rivard St, Detroit 11, Mich.

•



Fixtures

Nine new louvered slimline lighting fixtures have been introduced for low-brightness general illumination in commercial and industrial establishments. Available in 4, 6, and 8-ft lengths and with 2, 3, or 4-lamp units, these instant-starting fixtures use T-12 430-ma single-pin lamps. A special hinge fastens to either side of the fixture for easy relamping and maintenance.

Mitchell Mfg Co, 2525 N. Clybourn Ave, Chicago 14, Ill.

•

Entrance Switches

New design of the manufacturer's Type D 30-amp entrance switches provides straight-wire terminal connections within the switch box.

A wire channel indentation receives No. 14 and 8 straight wire. Instead of looping the wire around the terminal screw, insulation is removed, the wire laid in the channel, and terminal screw tightened.

Square D Co, 4335 Valley Blvd, Los Angeles 32, Cal.

•

FM Radio Telephone

Completely portable this two-way radio-telephone unit can be either hand or pack carried. Model 3035 is designed for operation in the 25 to

A user REPORTS...

After their satisfactory experience with the 500,000 C. M. insulated aluminum cable (at right), National Supply Co., Torrance, Cal., says, "We will seriously consider aluminum when similar installations are planned." These cables, insulated with RH 600 v. U. S. Paracore, are connected to bus, from which they carry current to distribution panels for such heavy loads as welding machines, shears, rolls and other equipment.

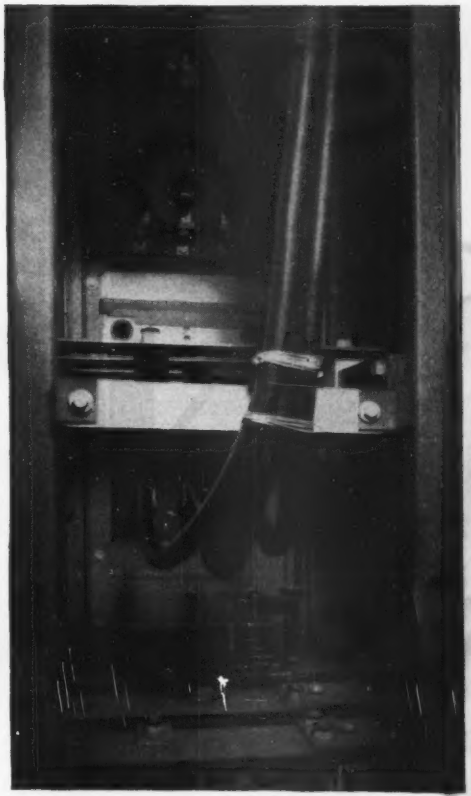


figure it in ALUMINUM and you figure it low

When you plan new production lines, add feeders for heavier loads, get prices both ways—in aluminum and in copper. You'll find you can make worth-while savings with aluminum . . . and installation is faster, easier because of aluminum's light weight.

Although the rearmament program restricts the use of aluminum, we are ready to help you with the planning for trouble-free, low-cost wiring.

FREE INSTALLATION BOOK

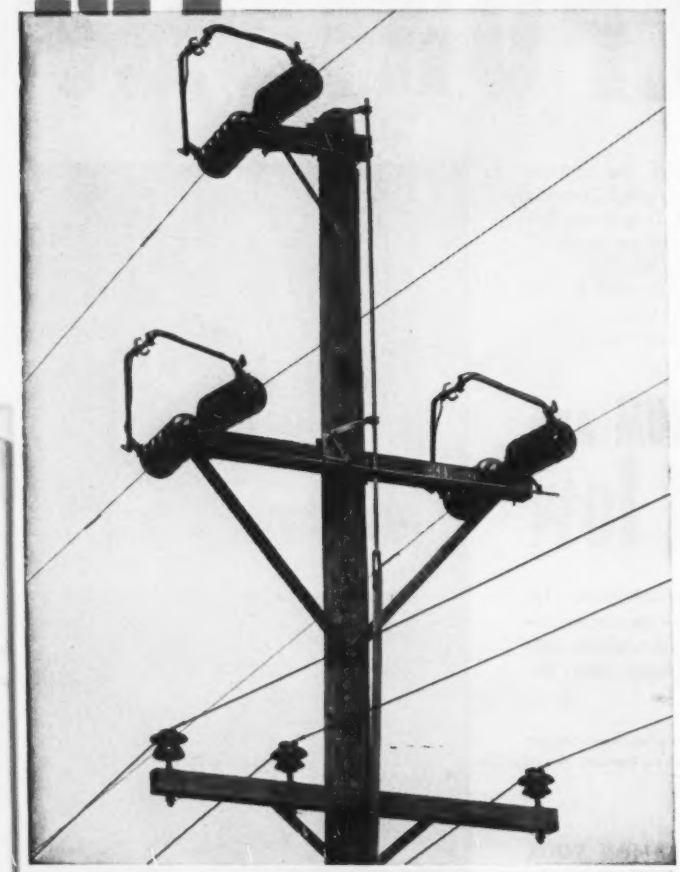
"Questions and Answers" on installation of aluminum conductors. Write for it now — ALUMINUM COMPANY OF AMERICA, 1776E Gulf Bldg., Pittsburgh 19, Penna.

Aluminum Conductors

ALCOA

of ALCOA EC ALUMINUM are made by leading manufacturers

KPF POLE TOP SWITCHES



Simple design
means economical installation

Bore two holes in a single crossarm, tighten two bolts, attach the conductors, and the switch is installed! No separate dead-ends, no "extra" insulators required. Saves man hours, saves installation costs.

Simple design also means lower first cost, less maintenance. Insulator stacks are readily adjustable for line sag. Free-floating, self-aligning, silver-surfaced blades and jaws maintain proper contact under all conditions of sag adjustment. Switches can be used in vertical, horizontal or triangular mountings. The low-cost, trouble-free service rendered by KPF switches is attested by the many thousands in use throughout the world.

KPF ELECTRIC COMPANY
857 Howard Street • San Francisco 3, Calif.

50-mc band and model 3036 in the 152 to 174-mc band.

Weighing only 19 lb these sets have a self-contained battery supply which, the manufacturer states, provides 50 to 100 hours of intermittent service.

Link Radio Corp, 125 West 17th St, New York 11, N. Y.

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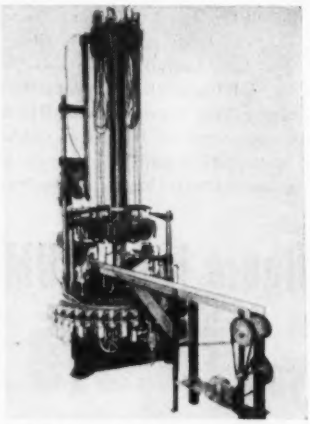


Bulb-Blowing Machine

Lamps can be blown into a mold of any feasible design or shape up to 2½ in. O.D. by 5½ in. over-all length, including stem or tubulation, by an automatic machine. Speeds up to 2,400 bulbs an hour may be attained.

A new feature of the 130-in.-high machine is incorporation of motor-operated cutting knives to replace old-style flame cutting. Improved chucks are said to reduce the waste of tubing ends. Aside from hand feeding of four-foot lengths of glass tubing, all other operations are automatic.

Kahle Engineering Co, North Bergen, N. J.

•

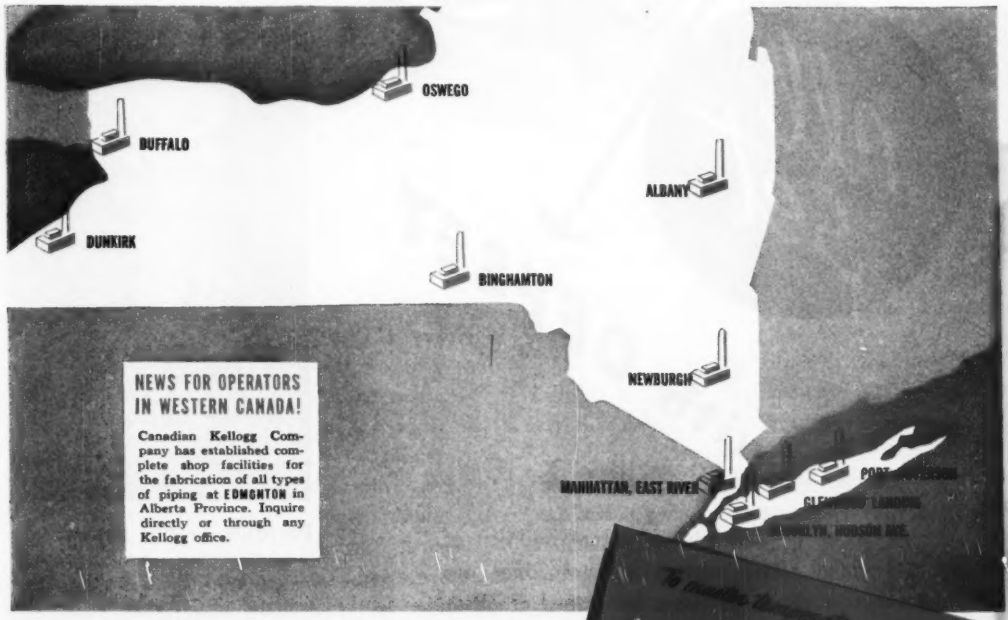
Ferritic Core Material

Molded from flaked powdered iron, a soft magnetic material is obtained that is claimed to be largely free of noise produced by magnetostriction effects. Called Caslam, it is now being used in transformers for frequencies of 50 cps to 10 kc.

The material has a laminated structure of very fine grain, with the layers aligned in the plane of the flux. Ring permeability is of the order of 1,000. Ac loss is almost entirely hysteresis, eddy current loss being less than 10% of the total. For this rea-

Note: Over 1,250,000 kws for New York State alone!

...within a very short space of time, we have contracted to fabricate the major power piping for over 1,250,000 kws. of additional steam power capacity for New York State alone. Most of these orders include job-site installations as well. All piping is for modern high-pressure, high-temperature systems — predominantly of the reheat type — with operating temperatures of 1000°F. or higher. When completed these new power installations will expand the state's total steam-generated capacity by well over 20%.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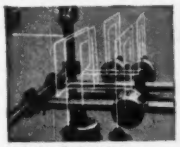
MANHATTAN, EAST RIVER
NEWS FOR OPERATORS IN WESTERN CANADA!
Canadian Kellogg Company has established complete shop facilities for the fabrication of all types of piping at EDMONTON in Alberta Province. Inquire directly or through any Kellogg office.

Special studies of unusual problems such as graphitization to assure long life and low maintenance.

Metallurgical research by recognized specialists who have made major contributions in this field.

M. W. KELLOGG
50th ANNIVERSARY
1901 · 1951



Exclusive Equipment for accurately analyzing stresses in piping and providing unique data for critical installations.

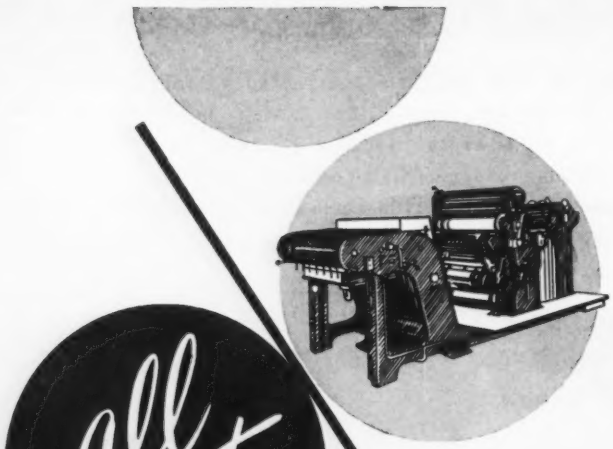
Complete facilities for the fabrication of steel products from simple forgings to specially cast bi-metallic devices.

Top welding performance in shops and in the field by welders accustomed to working under X-Ray checks.

Quality control, devised by metallurgical experts, embracing forming, heat treating and non-destructive testing.

Pressure Vessels
Vacuum Vessels
Fractionating Columns
Drums and Shells
Heat Exchangers
Process Piping
Bends and Headers
Giant One-Piece Bends
Forged and Welded Fittings
Radial Brick Chimneys

The M. W. Kellogg Company, (A Subsidiary of Pullman Incorporated) — Offices in New York, Jersey City, Buffalo, Los Angeles, Tulsa, Houston, Toronto, London and Paris.



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With our recent addition of two-color offset presses, we now offer our clients a choice of either letterpress or offset lithography for the finest in financial and corporate printing.

This important expansion of facilities by Sorg makes it the name to call when your problems require specialized printing of superior quality and speed.

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80 SOUTH ST., NEW YORK 7, N. Y.
Financial, Legal, Corporate Printers

Chicago Associate McCORMICK and HENDERSON, Inc.

London Associate The LEAGRAVE PRESS Ltd.

son, the ac permeability curve at 50 cycles is about equal to the dc figure.

Here is some basic data provided by the manufacturer:

Max. permeability at 4 kg	860
Effective permeability at 10 kg	500
Hysteresis loss for 10 kv, ergs/cc/cycle	7,000
Coercive force for B_{max} of 10 kg, oersteds	2.4
Saturation flux density, kilogauss	18
Total ac loss at 10 kg and 50 cycles, w/lb	2.5

A special TV-grade has also been developed.

The Plessey Co, Ltd, Ilford, Essex, England

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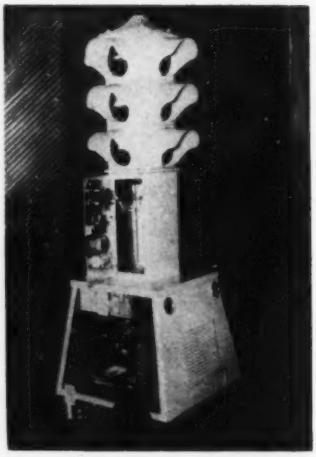


Portable Traffic Signal

Mounted on rubber-tired dolly wheels, a portable traffic signal may be towed to any part of the city needing emergency traffic control. Power is furnished by a 400-w gasoline-driven generator contained with the traffic signal. The signal can operate for 20 hr without attention if a large gasoline tank is installed inside the 90-in. high unit. Typical uses are at accidents, fires, parades, sports events.

D. W. Onan & Sons, Inc, Minneapolis, Minn.

•

Magnetic Starter

Designed for full-voltage, non-reversing starting and overload protection of squirrel-cage motors, this starter is equipped with a 3-pole air circuit breaker.

Circuit breaker is combined with a magnetic across-the-line starter, thermal overload relays and pilot-current holding contacts for use with

IN SERVICE SINCE 1914

. . . TO THE GREATEST OF SERVICE INDUSTRIES

For nearly four decades now, FARGO has specialized in filling certain vital requirements of American utility companies — both large and small.

The complete line of FARGO Wire and Cable Accessories ranks at the very top for quality of materials and workmanship, as well as for originality of design. Every individual FARGO item — connector, line splice, dead end, or whatever it may be — embodies design features, which lighten the lineman's job and assure constant, trouble-free service after installation.

Public utility executives, responsible for the immediate expansion of our national light and power facilities, will continue to look to FARGO with confidence during the present crisis — and in the years ahead.

To meet intensified demands, FARGO is taking every possible step to maintain its output, within regulations. Customers of long standing must rightfully be given *first choice*, while those seeking FARGO'S services for the first time will be given every consideration possible under existing conditions.

FARGO CONNECTORS

are built like a vise and grip like a vise — so they hold wires permanently. They insure a vibration-proof contact . . . require no attention after installation — and provide an ideal, low-resistance connection, at a cost no higher than that of ordinary types.

FARGO

Manufactured by

FARGO MFG. COMPANY, INC.

Poughkeepsie, N.Y.

Distributed by

LINE MATERIAL COMPANY

(A McGraw Electric Company Division)

Milwaukee, Wisconsin

WE BUILD IT tough-

SO YOU CAN TREAT IT rough!

It's Collyer SUPRENE Type RR — the cable you can trust both in the air and in the earth. You'll find this rugged cable serving in many different ways: in utility underground network systems, as an aerial cable, as a non-metallic parkway cable, as a direct-burial underground service entrance cable (Type USE), and in other services. Suprene is also approved as an airport lighting cable (CAA Spec. L-824 Type A).

Try it on the job. Its dense neoprene sheath makes Suprene mighty easy to pull, splice, and tap. This jacket gives maximum protection against sunlight, earth acids, oils, abrasion, moisture. Standard Insulations: Heat and Moisture Resistant rubber compound for lower voltage cables . . . Oil-Base Ozone Resistant Insulation for voltages exceeding 5000. For complete specifications and samples, write Collyer Insulated Wire Company, 245 Roosevelt Avenue, Pawtucket, Rhode Island.

CHOOSE *Collyer*

start-stop pushbutton controls. Low-voltage and overload protection are provided when start-stop controls are used.

Thermal overload relays provide inverse time overload protection and are said to follow the motor heating curve within close limits.

The Euclid Electric & Mfg Co, Madison, Ohio

MORE NEW PRODUCTS
about which you should know

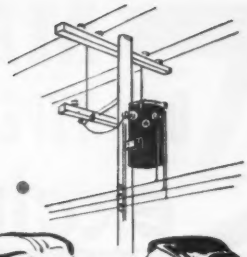
Fireye Corp, 77 Broadway, Cambridge 42, Mass., is manufacturing a fire protection block consisting of six detectors and one control panel covering 10,000 sq ft; can be installed in industrial areas, air conditioning duct systems, etc.

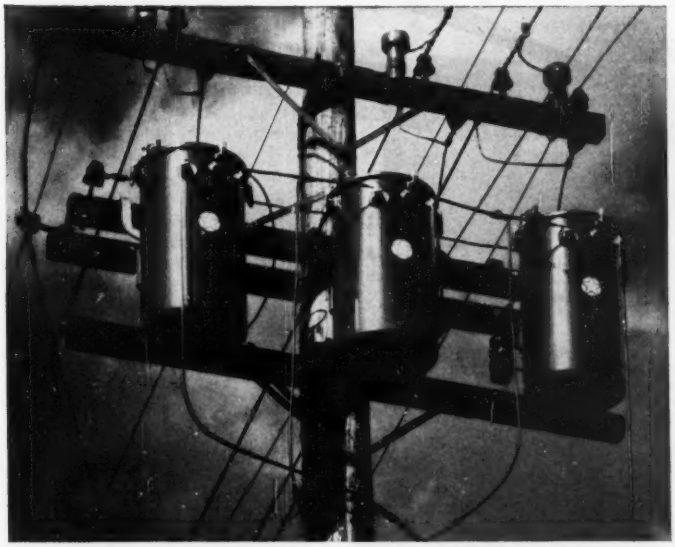
Clarostat Mfg Co, Inc, Dover, N. H., is making Type H3ON Greenohm **power resistors** as an easily replaceable heater, particularly for the tropics and where humidity is high; details in Bulletin 113. . . . Wilkor Products, Inc, 2882 Detroit Ave, Cleveland 13, Ohio, has announced a boro-carbofilm **resistor** for high-frequency applications in sizes from ¼ to 2 w. Temperature coefficient is 20 parts per million per deg C.

U. S. Engineering Co, 521 Commercial St, Glendale 3, Cal., is manufacturing the1400 series of molded insulated **miniature terminal lugs,** standoffs, and feed-throughs. Molded construction is said to eliminate internal air gaps that act as moisture traps. . . . Burrows Equipment Co, 1316-Dept 1A Sherman Ave, Evanston, Ill., has designed a **moisture tester** for all types of materials. It is direct reading for the range from 8.5% to 40%.

Rexton Finishes, Inc, 62 Woolsey St, Irvington 11, N. J., offers Rexadhere, an **industrial finsh** said to adhere to surfaces such as aluminum, steel, cadmium, plastic board, Bakelite, and zinc. . . . Ansul Chemical Co, Marinette, Wis., offers the Met-L-X dry powder pressurized **fire extinguisher** for hazardous metal fires. It is claimed to be moisture-repellent, free-flowing, non-corrosive, and a non-conductor of electricity. The powder forms an air-excluding crust over the burning metal.

The *Secret* of the POLE STAR . . .

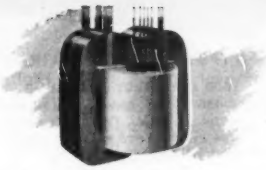




Laminations brought through the coils and individually lapped — that's the secret of the Pole Star core and why Pole Stars are recognized for their low exciting currents and their many other advantages.

Core laminations individually lapped

★ Low exciting current is an inherent characteristic of the Pole Star. The large cross section area at the lap reduces the density and prevents a concentration of flux. Therefore, the reluctance of the magnetic circuit is low. Actually, each lamination is a core itself, forming its own magnetic path undisturbed by butt joints and points of high density.



75 Kva Core and coil unit

★ The lapped Pole Star construction eliminates the need for clamping the core. No mechanical clamping device is required since there are no gaps or butt joints in the core. Each Pole Star core lamination is lapped on itself. The amount of contact pressure between laminations is not important. As a result, the noise level in the core is fixed at a low level, and will not change.

Core and coil units easily taken apart and rebuilt

★ In the event a coil is damaged by lightning or excessive overloading, cores can be taken apart and rebuilt with replacement coils. This can be done without appreciably affecting the low core loss or exciting current of the Pole Star. Utilities recognize the great savings in time and money derived from being able to replace coils in their own shops. All Pole Star core and coil units, 3 Kva through 100 Kva, can be taken apart and reassembled.

Pole Star transformers are available in single phase sizes 3 Kva to 100 Kva and in vertical three phase sizes 9 Kva to 112½ Kva, 14,400 volts and below.

Pennsylvania TRANSFORMER COMPANY

Canonsburg, Pennsylvania - Greater Pittsburgh District

P.S. Let the **POLE STAR** be your guide . . .

Product Of Long Experience — Safe Thrifty And Reliable

MARCUS
DRY TYPE TRANSFORMERS
exclusively!

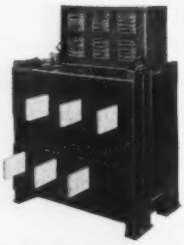
THE MARK OF QUALITY
MTC

TYPE ACO

All purpose, indoor or outdoor, dry type distribution transformers. Sizes to 100 KVA, voltages to 5000 V.

TYPE C

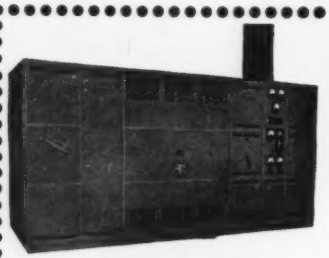
General purpose transformers, 600 volts and below; 1-15 KVA inclusive, single or three phase completely self contained.



FURNACE TRANSFORMER

3 PHASE, 3/2 PHASE, 1 PHASE

Uses—Forging, heat treating, melting, resistance heating, welding, etc.



TYPE F - UNIT SUBSTATION

1000 KVA, 4160Y 60 Cycles, 3 Ø —480 delta; Fused, load interrupter on H.V. (left). Drawout type breakers and metering equipment on L.V.

ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DRY TYPE TRANSFORMERS EXCLUSIVELY

1 to 2,000 KVA up to 15,000 Volts to meet Individual Requirements

- DISTRIBUTION
- GENERAL PURPOSE
- UNIT SUBSTATION
- PHASE CHANGING
- ELECTRIC FURNACE
- RECTIFIER
- WELDING
- MOTOR STARTING
- SPECIAL

MTC produces a complete line of quality transformers to 2000 KVA. A newly expanded plant with the most modern equipment, plus a background of years of dry type specialization, assures maximum transformer value.

NEMA

MARCUS TRANSFORMERS CONFORM TO THE STANDARDS OF N.E.M.A. AND A.I.E.E.

Representatives in Principal Cities

MTC

MARCUS TRANSFORMER CO.
INC.
30 MONTGOMERY STREET
HILLSIDE 5, NEW JERSEY

PIONEERS IN THE FIELD OF AIR COOLED TRANSFORMERS

WHAT THEY'RE SAYING
at industry meetings

There Is A Selling Job To Do

Louis V. Sutton, *president, Edison Electric Institute and Carolina Power and Light Co, before the 17th Annual EEI Sales Conference, Chicago.*

In our business, as in all others, in times of peace or war, we should never forget to sell. Whether or not appliances are available, there is a selling job to do in the electric utility industry. I urge you not to permit a deterioration of your sales organizations. If your sales training courses do not provide for keeping your sales staffs abreast with development within the industry, I hope you will inaugurate such training at the earliest possible moment. Every sales contact is an opportunity to tell our industry story and to expose the real purpose behind the creation of a super-power system by Federal grants and subsidies.

A Three-Year Forecast

C. B. McManus, *administrator, Defense Electric Power Administration, at the 8th Annual Convention of the American Public Power Assn, Chattanooga.*

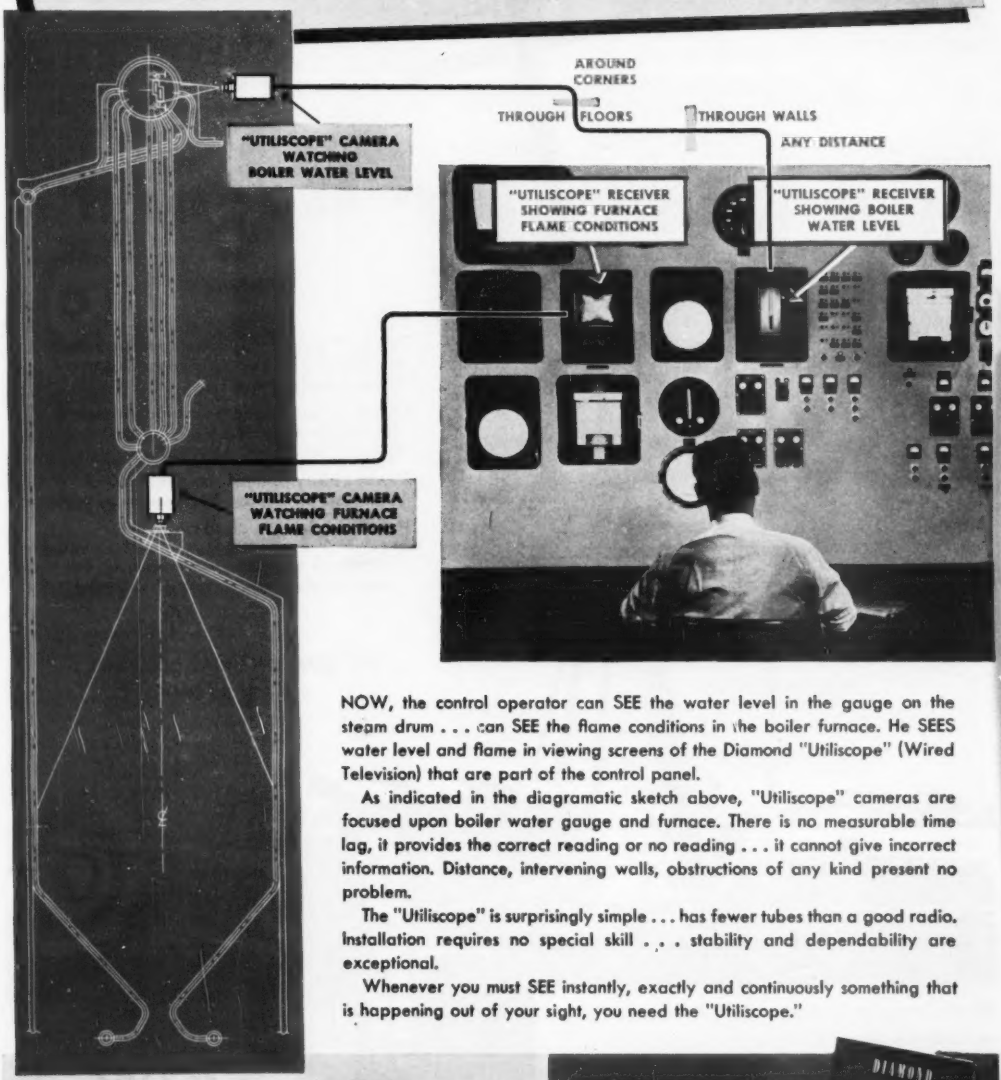
By the end of this year we will have the total load we planned to have by the end of 1953. We expect to have by 1953 a total of 12 million kw more load than we expected before Korea. The power program as now planned contemplates increasing generating capability a total of 27 million kw by 1953.

We now believe that load growth over the next three years will be approximately 12% per year—double the normal load growth. The power supply situation generally will be tight this year and next year, even if installations are made on schedule. But by 1953 the general picture will be improved.

The Pacific Northwest is the number one shortage area. This condition will not be substantially improved until some of the major hydro projects come in. There will probably be no relief through 1953. The Southeast region will also be very tight but by 1953 we trust that conditions there will be improved.

Regarding supplies of materials, we

The "UTILISCOPE" (WIRED TELEVISION) Brings REALISM to Centralized Control


AROUND CORNERS
THROUGH FLOORS
THROUGH WALLS
ANY DISTANCE
"UTILISCOPE" CAMERA WATCHING BOILER WATER LEVEL
"UTILISCOPE" RECEIVER SHOWING FURNACE FLAME CONDITIONS
"UTILISCOPE" RECEIVER SHOWING BOILER WATER LEVEL
"UTILISCOPE" CAMERA WATCHING FURNACE FLAME CONDITIONS

NOW, the control operator can SEE the water level in the gauge on the steam drum . . . can SEE the flame conditions in the boiler furnace. He SEES water level and flame in viewing screens of the Diamond "Utiliscope" (Wired Television) that are part of the control panel.

As indicated in the diagramatic sketch above, "Utiliscope" cameras are focused upon boiler water gauge and furnace. There is no measurable time lag, it provides the correct reading or no reading . . . it cannot give incorrect information. Distance, intervening walls, obstructions of any kind present no problem.

The "Utiliscope" is surprisingly simple . . . has fewer tubes than a good radio. Installation requires no special skill . . . stability and dependability are exceptional.

Whenever you must SEE instantly, exactly and continuously something that is happening out of your sight, you need the "Utiliscope."

DIAMOND POWER SPECIALTY CORP.
LANCASTER, OHIO

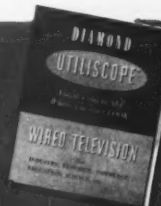
The "UTILISCOPE"— First in Industrial Television

Diamond Specialty Limited — Windsor, Ontario

The "UTILISCOPE" (Reg. U. S. Patent Office)

WRITE FOR BULLETIN 1025

with complete description; it suggests many other possible uses.



"For the Record"

PENTA * has a superior performance record of 15 years of protecting wood from termites and rot.

PENTA is an approved wood preservative and is a standard of the American Wood Preservers Association.

PENTA chlorophenol is a chemical of constant, uniform effectiveness.

PENTA is clean . . . will not leach.

** PENTA is a popular abbreviation of the name of the chemical, PENTAchlorophenol.*

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

Write *for Dow's free booklet, "Pointers on Penta."*

The Dow Chemical Company
Dept. PE 18
Midland, Michigan

Name _____ Title _____

Company _____

Address _____

City _____ State _____

DOW
Penta
chlorophenol

found that during the second quarter of this year the electric utility industry would need 50% more aluminum than it used in the same period last year. We asked for 53½ million lb of aluminum and we received 49 million lb for the second quarter. This allotment was backed by a set aside of aluminum.

Copper requirements were up only slightly over last year. We asked for 111 million lb of copper and received 92 million lb. Steel requirements for the second quarter were 80% greater than last year. We requested 98 thousand tons of steel for May and June. We received an allotment of 90 thousand tons for each of these months. We do not know what allotments will be for the third quarter.

By the end of next year expansion in the aluminum industry will add roughly 60% to the primary capacity existing in June of last year. Current plans for the steel industry call for capacity of 117 million tons by early 1953. Plans for expanding the copper supply call for a boost in foreign production and the opening of new deposits in this country. Increases from these sources will not be large until after 1951, and not then from foreign sources unless the tariff is removed.

At present we do not have the "project approval" type of assistance used during World War II, although this type of assistance has been obtained in certain very urgent situations. We do not believe that project approval will soon be available on a general basis for the electric utility industry.

Don't Ignore Electronics

Dr. W. R. G. Baker, *vice president and general manager, Electronics Department, General Electric Co, before the Petroleum Industry Electrical Assn, Dallas, Texas.*

The science of electronics will help increase the productivity of industry in the battle of production now facing America. The United States is conducting an experiment in growing in productivity. This experiment must be successful and I feel it will be successful. Electronics cannot do it alone, but it is the science upon which the nation can rely; the science we cannot afford to ignore; the science in which we must, for our own security, keep far ahead of the rest of the rest of the world.

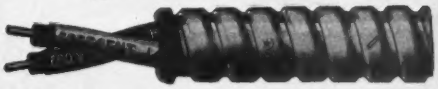
CRESCENT

Makes A Complete Line Of

ELECTRICAL WIRES & CABLES

SYNTHOL *Building Wires, Type TW*

ENDURITE *Building Wires*
Type RH-75°C or RW-60°C



A B C *Armored Cable*

Service Cable, Types SE-U; SE-A; SD

IMPERIAL *Neoprene*
Portable Cords & Cables

Parkway Cables, All Types

Varnished Cambric Cables

CRESCENT

OVER 60 YEARS EXPERIENCE

WIRE AND CABLE

CRESCENT INSULATED WIRE & CABLE CO.

TRENTON, N. J.

Mallory Creative Research

Develops Low-Cost Technique For Platinum-Tipped Contact

New time and money saving methods for meeting customer contact specifications result from continuing research and development by Mallory.

Typical is the application of Mallory metallurgical and welding experience to the problem of attaching and forming the platinum tip on a contact screw used in home thermostats. Mallory tackled the problem of reducing the high cost involved . . . and came up with a new weldable material for the screw, a way to weld the tip in place more securely, and a method for forming the tip to proper contour. Savings on machining and waste platinum were immediately passed on to the customer.

That's result beyond expectation!

Mallory contact know-how is at your disposal. What Mallory has done for others can be done for you.

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

MALLORY PLATINUM CONTACTS

Platinum is ideal for electrical contacts where low resistance must be maintained for long periods of time. However, pure platinum lacks hardness. Mallory platinum alloys overcome this by the use of such hardening agents as iridium, ruthenium and palladium. Mallory is fully qualified to recommend the best contact material for your design. Write today.

Electrical Contacts and Contact Assemblies

P. R. MALLORY & CO., Inc.

MALLORY

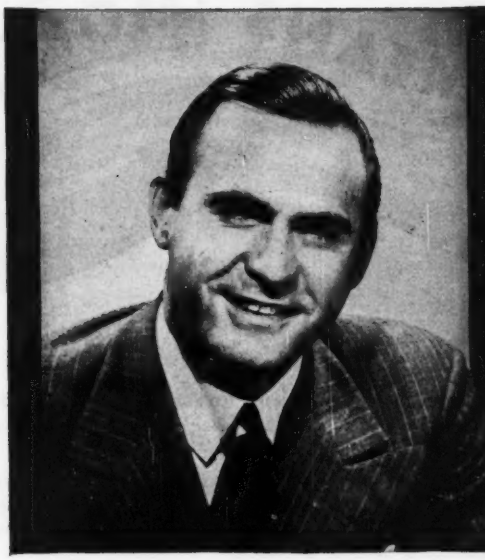
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

SERVING INDUSTRY WITH

Electromechanical Products
Resistors *Switches*
TV Tuners *Vibrators*

Electrochemical Products
Capacitors *Rectifiers*
Mercury Dry Batteries

Metallurgical Products
Contacts *Special Metals*
Welding Materials



HERE ARE Down-to-Earth Reasons WHY I SPECIFY ORANGEBURG

— Says the Utility Engineer

In plain language this is what the Utility Engineer means. Orangeburg Conduit provides a *permanent* cable raceway *underground*. It will not corrode, lasts indefinitely. Its impermeable wall and tight joints prevent corrosive ground waters from entering. Orangeburg lays faster at lower cost. Protects cable sheath from abrasion when pulled in—also from wear during cable movement due to alternate expansion and contraction with changing loads. Resists acids, alkalis, grease, oil. Orangeburg Conduit is tough, durable and resilient—will not crack or break when properly handled.

PROTECTION . . . POWER . . . PRODUCTION

They are big words under today's conditions because permanently protected cables keep the *power* flowing and the *production* up to essential volume. The Utility Engineer appreciates the close connection between cable *health* and community *wealth*. Orangeburg is a magic name . . . and has been for 58 years . . . with public utilities and municipalities . . . because the lasting protection that Orangeburg Conduit gives electrical services underground assures uninterrupted power for all users of electricity.

Orangeburg saves money, too, by faster and easier handling, tooling and laying . . . and by supplying a complete line of delay-preventing standard fittings for conduit. Orangeburg Manufacturing Co., Inc., Orangeburg, N. Y.

ORANGEBURG STANDARD

. . . installed with concrete encasement. The preferred conduit for banks of three or more ducts.

ORANGEBURG NOCRETE

. . . installed without concrete encasement. Its extra heavy wall makes NOCRETE practical for many single or double duct runs.

ORANGEBURG FIBRE CONDUIT

STANDARD Installed with Concrete

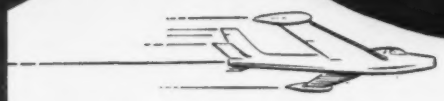
NOCRETE Installed without Concrete

GENERAL ELECTRIC SUPPLY CORPORATION

DISTRIBUTORS, ORANGEBURG FIBRE CONDUIT

GraybaR ELECTRIC COMPANY

"Preformed" MEANS MORE



Did you ever take a straight piece of spring wire and attempt to wrap it uniformly around a rod . . . or a conductor? Try it. You will then begin to appreciate a few of the outstanding merits of PREFORMED Armor Rods.

The photograph at the top of this advertisement shows Aluminum Alloy PREFORMED Armor Rods. Note the absolute *uniformity* of the helices. The pitch of each helix is 9 times the diameter of the conductor or strand to which it will be applied. The inside diameter of each helix is 85% of the conductor diameter.

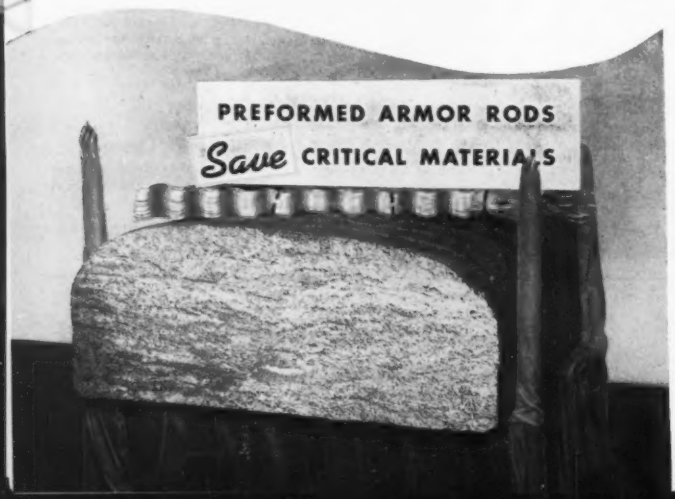
Such exact PREFORMING can be done only in the Factory by precision tools and methods. It is impossible to attain such perfection in the Field with any hand tools or practices.

Every PREFORMED Armor Rod is exactly like all others of the same size. On the display truck (below left) are 34,000 PLP Rods for No. 4 ACSR. They are sufficient to armor 226 miles of conductor . . . single-phase, light loading. ALL RODS ON THE TRUCK ARE IDENTICAL.

Such UNIFORMITY is of extraordinary value TODAY in view of the manpower demand and the scarcity of aluminum and copper.

Preformed Armor Rods *SAVE MAN-HOURS* because linemen can install them in just a fraction of the time required for any other accepted method . . . and do a better job. No tools of any kind are required for the majority of installations. Clamps, time-consuming bolts and nuts are not needed.

Preformed Armor Rods *SAVE CRITICAL MATERIAL* because they make possible (1) the repairing and rebuilding of transmission lines, (2) the rehabilitation of old conductors, (3) the increase in current-capacity of existing lines and (4) the lengthening of the life expectancy of present and future lines.



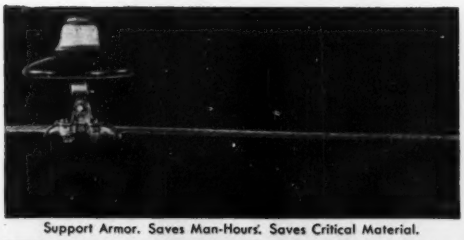
★ EACH POUND OF PREFORMED ARMOR RODS USED MAKES POSSIBLE A POTENTIAL SAVING OF 7/10 POUNDS OF CRITICAL ALUMINUM. WRITE ON YOUR LETTERHEAD FOR COMPLETE DETAILS.

PLP

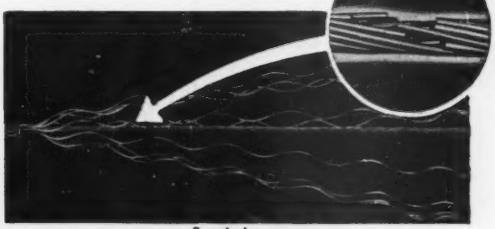
TODAY THAN EVER BEFORE...

Get the most from Preformed Armor Rods

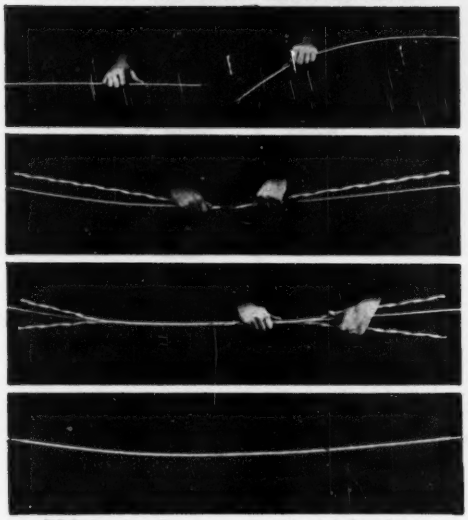
These revolutionary new rods are not just for the armoring of transmission conductors at support points. Utilities throughout the Country are using them for many other jobs. Here are just a few examples:



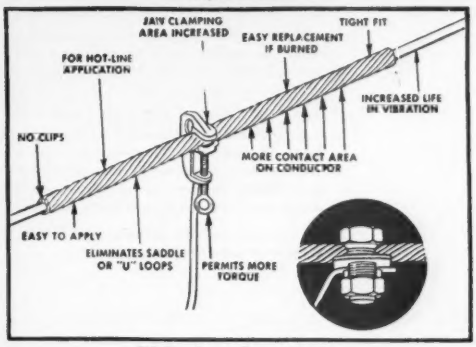
Support Armor. Saves Man-Hours. Saves Critical Material.



Repair Armor



PLP Rods make splices stronger than the original conductor.



PLP Tap-Armor Easy to Apply

also.. Preformed Jumpers, Strand Armor, Dead-Ends for Guys and Conductors, Tie Wire, Dual-Conductor Spacers, Lashing Armor, Dampers and Suspension Clamp Jumpers.

PREFORMED LINE PRODUCTS CO.

5349 ST. CLAIR AVENUE CLEVELAND 3, OHIO

to produce for peace and defense

There's twice as much Power on AG&E lines

What will it be? Fedoras or helmets . . . sedans or tanks? And in what quantities?

Nobody really knows right now how much of America's capacity to produce will be devoted to civilian goods in the months ahead, and how much to the materiel of war. But two things are certain:

First, industry — on a war or peacetime basis — makes greater use of electricity today than ever before in history.
Second, the companies of the American Gas and Electric System are in better shape than ever to meet both military and civilian demands for electric power.

Both types of demand were met promptly and adequately by the companies of the AG&E System all through the crucial years of World War II. Today — thanks to new plants and additions to older ones — our customers have *more than twice as much* electricity available to them as there was at the time of Pearl Harbor, only nine short years ago.

And in 1951 another 450,000 kilowatts is coming on the line, still another 350,000 come on in '52, and 600,000 more the year following. That will bring the System's total capacity to 3,739,000 kilowatts by the summer of 1953. *And if more is needed it will be forthcoming.*

Such is the reassuring power picture in the seven-state area the System serves.

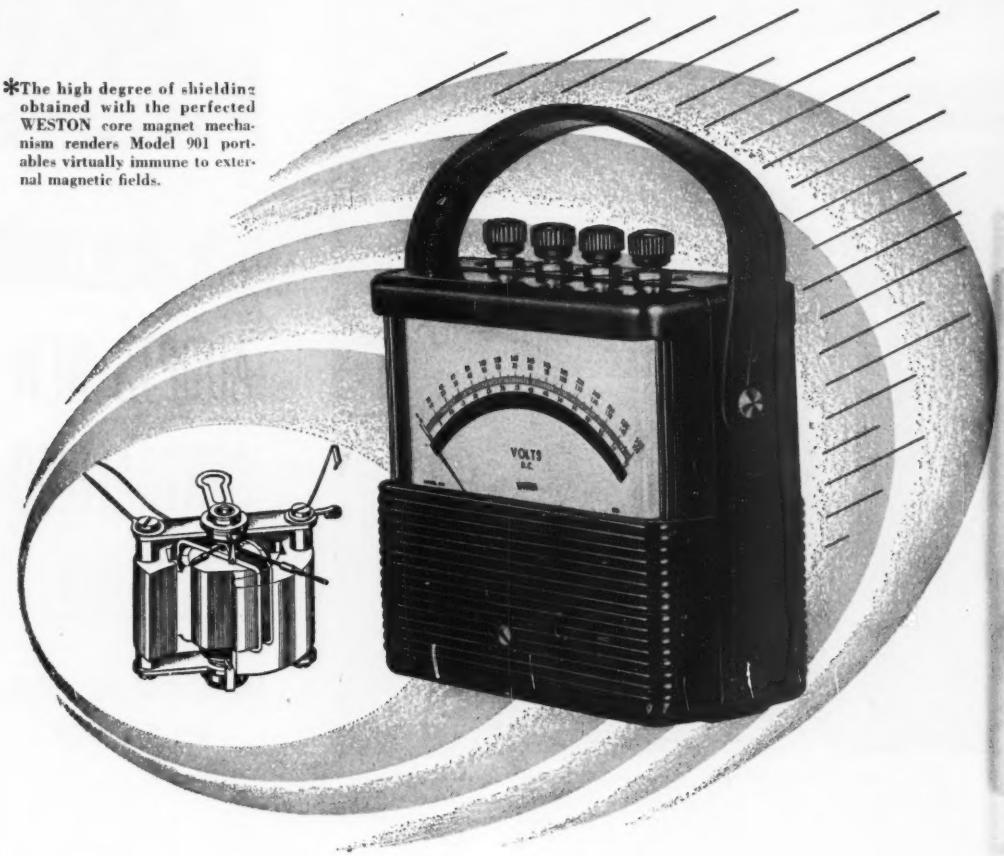
American Gas and Electric Company

and its operating subsidiaries

Appalachian Electric Power Company
Central Ohio Light & Power Company
Indiana & Michigan Electric Company
Kingsport Utilities, Incorporated
The Ohio Power Company
Wheeling Electric Company
Kentucky and West Virginia Power Company, Inc.

*Inherently SHIELDED

*The high degree of shielding obtained with the perfected WESTON core magnet mechanism renders Model 901 portables virtually immune to external magnetic fields.



FOR years instrument engineers have tried to build the magnet inside the moving coil for a more compact, more stable, inherently shielded d-c mechanism. In the Model 901 d-c portable instruments, Weston provides a practical and proved design of this type. The Weston core magnet construction gives uniform flux field over a wide deflection angle . . . withstands extreme mechanical abuse . . . and is exceptionally well shielded without increase in size and with a reduction in weight. Be sure to get the details of this remarkable development from your local Weston Representative, or write Weston Electrical Instrument Corporation, 594 Frelinghuysen Avenue, Newark 5, New Jersey . . . manufacturers of Weston and Tagliabue instruments.

WESTON *Instruments*

U. N. BUILDING ADOPTS NEW CENTRALIZED CONTROL

for convenience, safety and flexibility

AIR CONDITIONING and miscellaneous motor controls in U.N. Secretariat Building are operated through this Trumbull CENTR-A-POWER Control Center. The control center is fed from the Trumbull FLEX-A-POWER LVD busway distribution system running throughout the building.

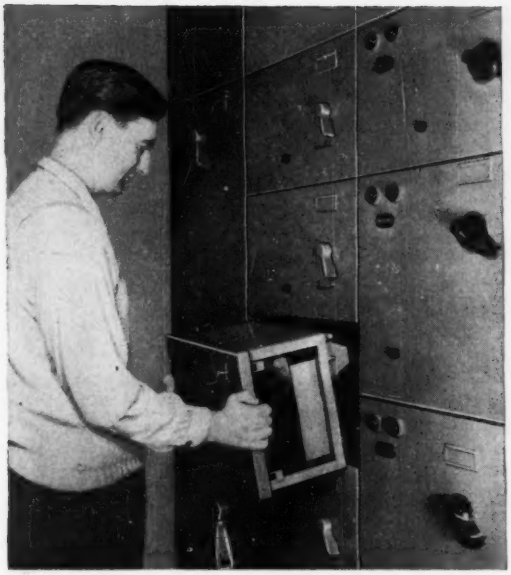
Centralizing all motor controls in one compact, flexible arrangement of front-connected troughs is an idea that appealed to the designers of the United Nations' new permanent headquarters.

Today, operators of the building's equipment enjoy the convenience, convertibility, safety and attractive appearance of Trumbull's new CENTR-A-POWER Control Centers.

Standardized starter-and-disconnect units are grouped in pre-fabricated, rigid steel troughs, in any arrangement. Any number of troughs can be set up in a variety of formations: back-to-back, "U," "L," etc. The control units, called CENTR-A-PLUGS, which are plugged into silver-plated vertical bus bars, are interchangeable from one trough to another.

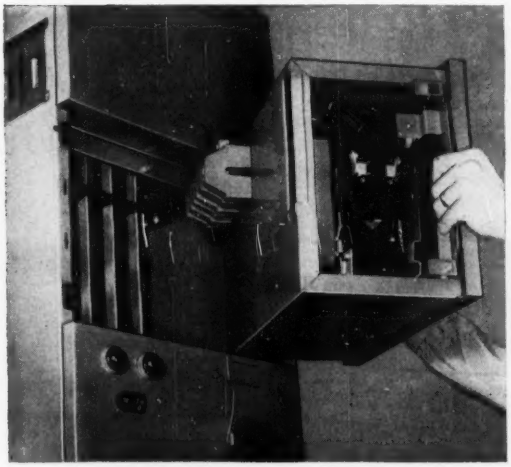
Trumbull's CENTR-A-POWER control center is a companion to the recently-announced CENTR-A-POWER switchboard, and is another in the series of new Trumbull developments for greater economy, safety and efficiency in electrical control and distribution.

Write for CENTR-A-POWER Bulletins to THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn.

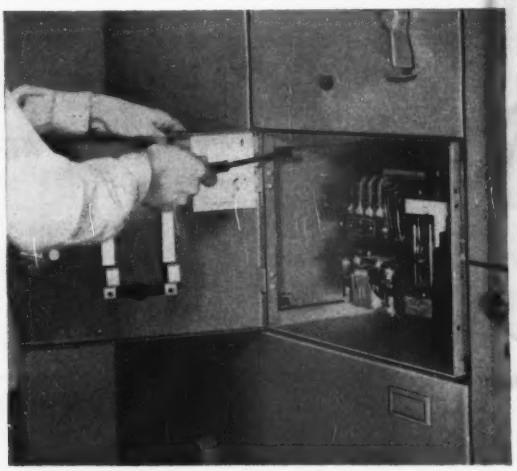


LOW-COST INSTALLATION results from standardization of components. From the complete selection of troughs and control units, the exact combination can be made up to meet any requirements. Floor space is saved by the compact all-front-wired trough design. Yet the ample gutter saves time by giving easy access to wiring.

EASY TROUGH ADDITION recommends CENTR-A-POWER Control Centers for applications where needs may change from time to time. Arrangements of both troughs and controls can be easily altered or added to, and even bus capacity can be increased as conditions require without change in insulators or steelwork.



SIDE-VENTILATED CENTR-A-PLUG is stabbed in from front. Each unit contains a starter-and-disconnect unit, which may be either Trumbull's new HCI high-capacity interrupter safety switch or a Trumbull AT circuit breaker. Ventilated side construction, together with trough vents top and bottom, keep controls uniformly cool.

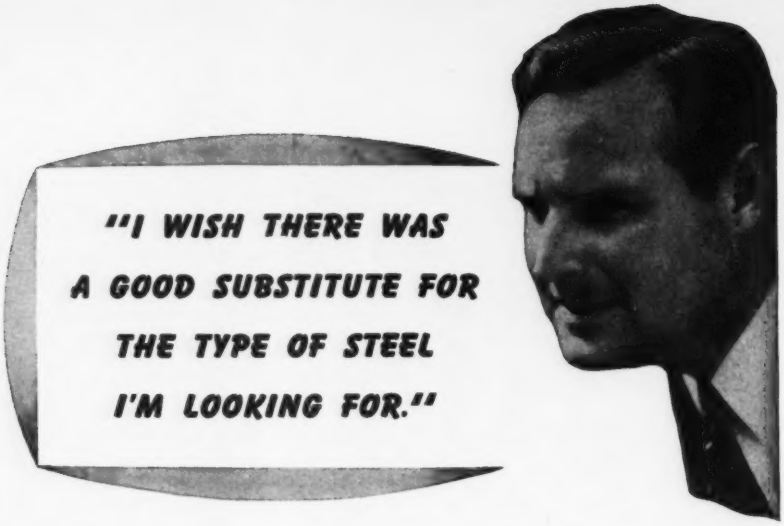


SAFE, EASY SERVICING is provided by the interlock which requires the disconnect handle of the deadfront CENTR-A-PLUG to be moved to OFF position before it can be opened . . . and by the quick-clip method of attaching the control unit to the trough which eliminates the nuisance of screws, nuts, and loose parts.

TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY

PLAINVILLE, CONN.



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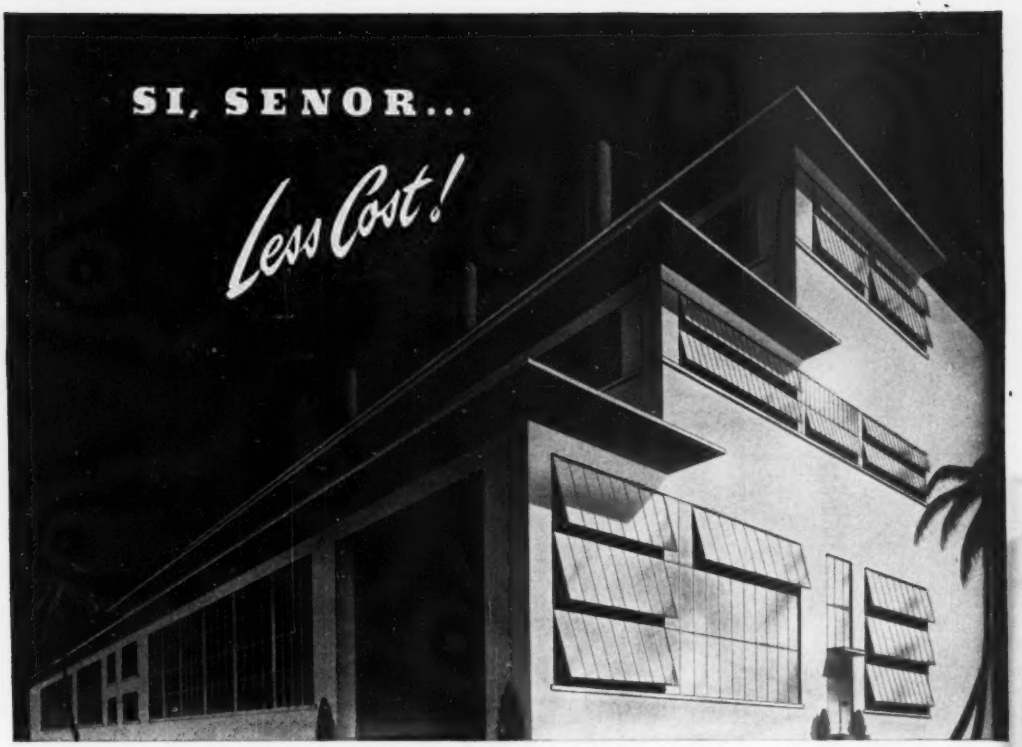
UNITED STATES STEEL



Designed and built in South America by The Kuljian Corporation

NO MATTER where it is built—in the high latitudes or down in the tropics—a power plant or industrial power installation under the Kuljian System costs less.

This is due to savings gained by advantageous buying of materials, to the long experience and intensive training of engineers, and to the mechanical proficiency of construction teams *plus the Kuljian System.*

The Kuljian System is available three ways:

PLAN 1 covers designing of the new plant including engineering supervision of construction.

PLAN 2 covers construction only, working from plans prepared by your own or other engineers.

PLAN 3 covers complete services—designing, engineering and construction—carrying the project from inception to initial operation.

Why not call Kuljian when ready to discuss your plans for the future?

WASHINGTON, D. C.
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CALCUTTA, INDIA
CARACAS, VENEZUELA
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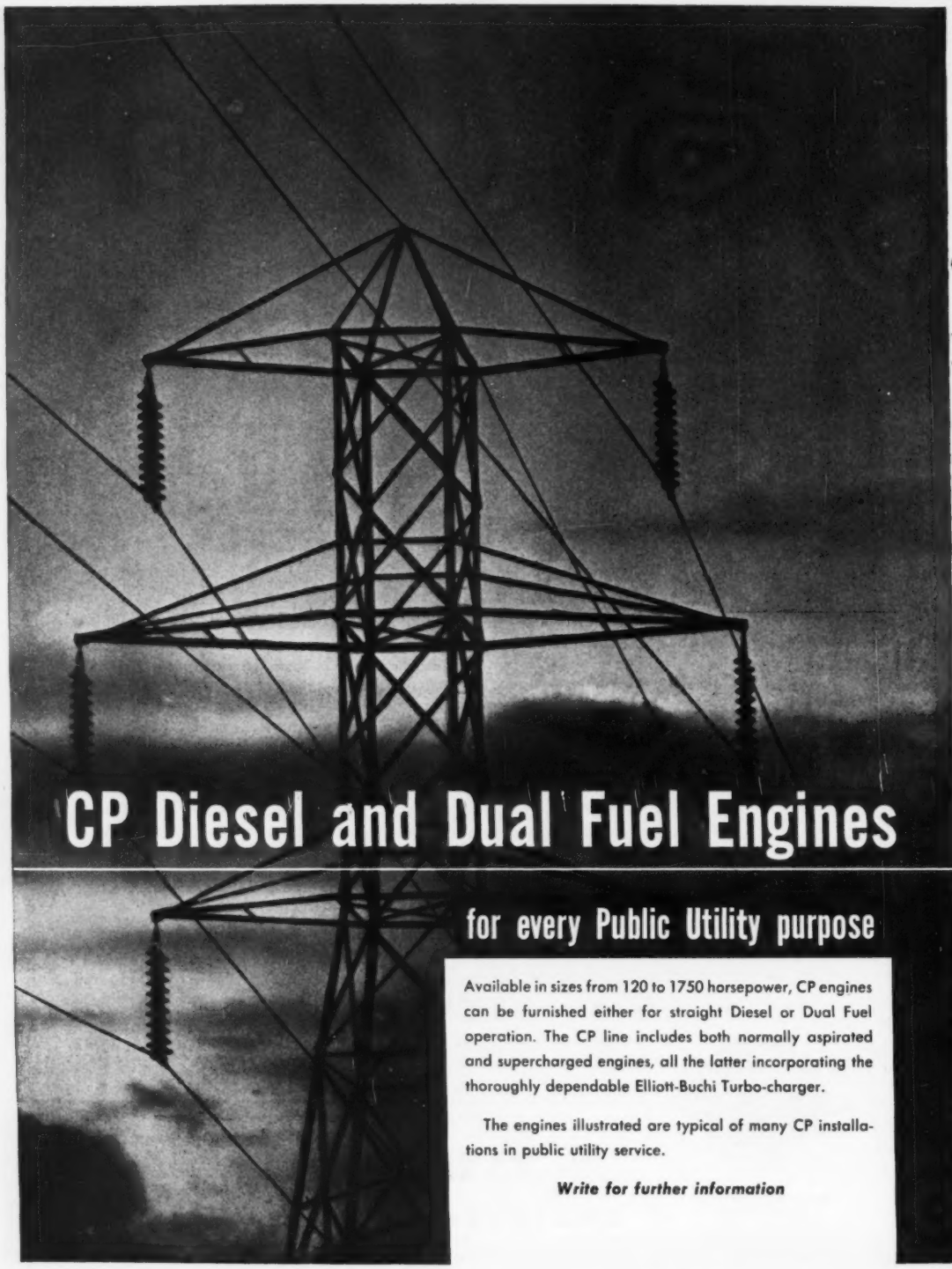
The **Kuljian** *Corporation*

ENGINEERS • CONSTRUCTORS

1200 NORTH BROAD STREET, PHILADELPHIA 21, PA.



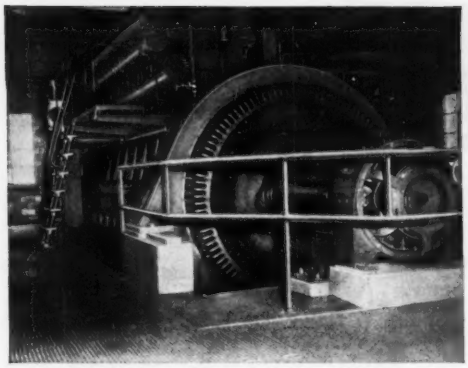
CP Diesel and Dual Fuel Engines

for every Public Utility purpose

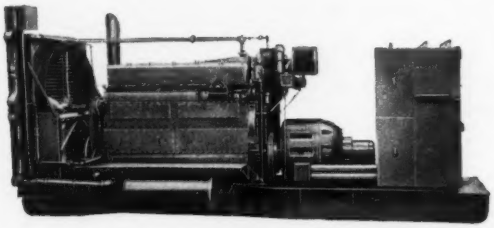
Available in sizes from 120 to 1750 horsepower, CP engines can be furnished either for straight Diesel or Dual Fuel operation. The CP line includes both normally aspirated and supercharged engines, all the latter incorporating the thoroughly dependable Elliott-Buchi Turbo-charger.

The engines illustrated are typical of many CP installations in public utility service.

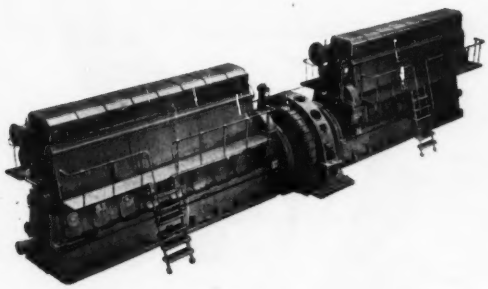
Write for further information



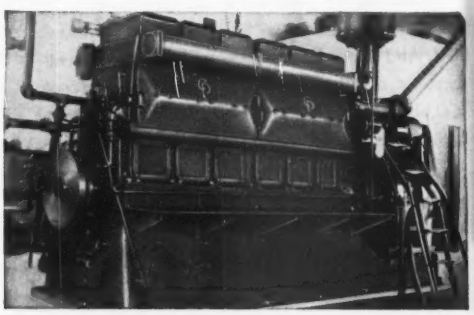
1650-hp Dual Fuel Generator unit in public utility plant – 327 rpm, 1150 kw.



500-kw CP Portable Generator unit for public utility emergency service.



Twin Engine Generator unit rated 2250 hp, 1500 kw.



A 175-kw Diesel Electric unit in a prominent utility plant, with more than 14,000 hours service to date.

CHICAGO PNEUMATIC TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

It's no trick

TO CUT POLE REPLACEMENT COSTS WITH U·S·S CREOSOTE OIL

● There's no magic about the savings made possible by treatment with U·S·S Creosote Oil. Poles and crossarms that have been treated with this time-tested preservative last years longer . . . require far fewer replacements than untreated poles.

The adequate penetration and high toxicity that spell long life are characteristic of U·S·S Creosote Oil. And continuous processing in the world's largest tar distillation plant makes U·S·S Creosote Oil absolutely uniform in quality . . . the same good results can be obtained application after application.

If you're interested in cutting replacement costs in future years, make sure that U·S·S Creosote Oil is used in all your wood-treating operations. If you'd like additional information, contact the nearest sales office listed below; there's no obligation

UNITED STATES STEEL COMPANY
525 WILLIAM PENN PLACE • PITTSBURGH 30, PA.
71 Broadway, New York 6, N. Y.
208 South La Salle St., Chicago 90, Ill. 1509 Terminal Tower, Cleveland 13, Ohio
Brown-Marx Building, Birmingham 2, Ala. 25 Beale St., San Francisco 5, Calif.

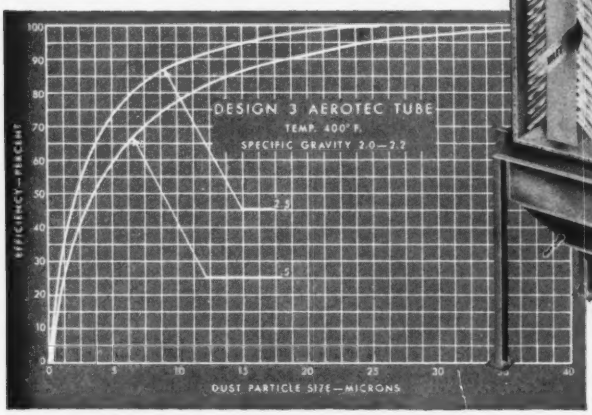
USS

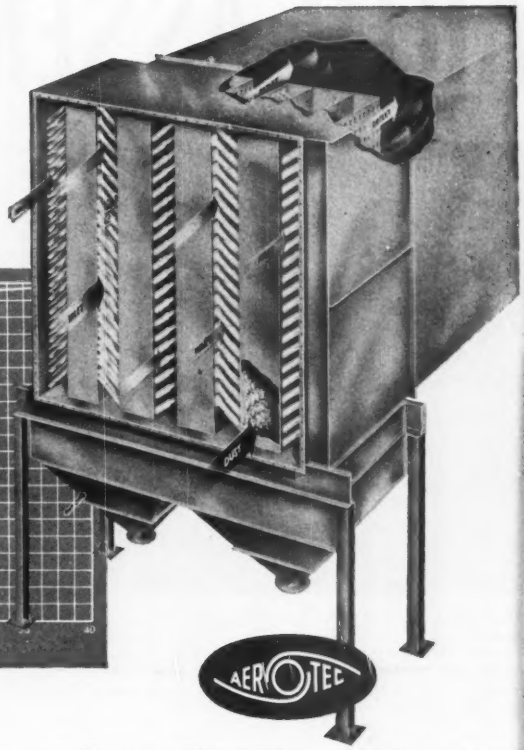
CREOSOTE OIL

UNITED STATES STEEL

ON *Full* OR *Partial* LOADS

AEROTEC DUST COLLECTOR EFFICIENCY *is still high*





Keeping efficiency high on a fluctuating boiler load is important in meeting dust ordinances. The Aerotec Design 3RAS Collector has solved this problem by the use of small diameter tubes.

It will be seen from the curve that 2.5 w.g., efficiency on 20 micron particles, at full load, is 98%. Reducing the load to 0.5 w.g., equivalent to half load, the Aerotec Collector still provides an efficiency of 91.5%, ample to meet most dust ordinance requirements encountered.

These small diameter tubes also provide a compact unit that will fit into almost any space requirement, a factor that is extremely important when the installation is made in an existing power plant where space is usually at a premium.

Project and Sales Engineers

THE THERMIX CORPORATION

Greenwich, Conn.

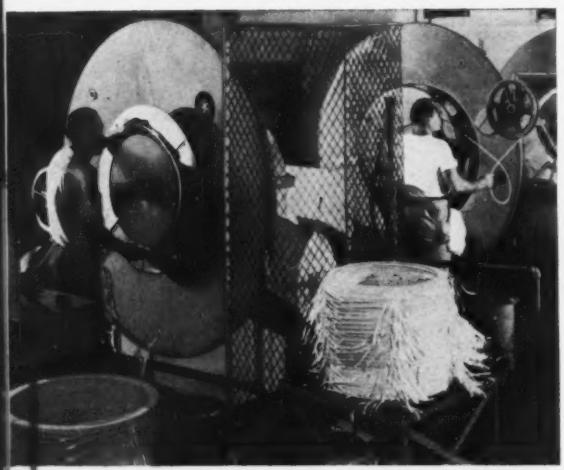
(Offices in 28 Principal Cities)

Canadian Affiliates: **T. C. CHOWN, Ltd.,** *1440 St. Catherine St., W., Montreal 25, Quebec*

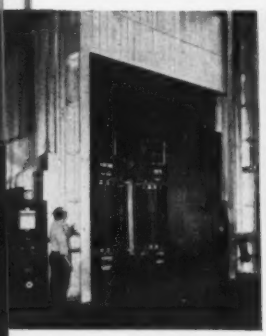
THE AEROTEC CORPORATION

GREENWICH, CONN.

MORE POWER FOR AUTO ASSEMBLY PLANT



These special machines wind a pair of high voltage disc coils simultaneously with uniform tightness from a continuous conductor. This method eliminates connections at the center of the double coil. Coils are stacked, clamped, and brazed together. Uniformly placed spacers are cemented between the coils, giving good mechanical support without impeding circulation of the coolant.



Two of eight ovens designed specially for high velocity drying. Air is completely circulated every two minutes and changed every four minutes. The core and coil assembly is baked until completely dried and checked by power factor and megger readings. After drying, all bolts are tightened and the assembly is immediately placed in insulating liquid in its own tank.

Radiators are made corrosion-resistant by a 5-step bonderizing process and then rotary flow painted.

On the right is a radiator being hoisted from the oven after baking for 15 minutes at 350°F. This produces a smooth, tough surface that resists industrial atmospheres and severe climatic conditions.

Consumers Power Company of Michigan Installs Two More Allis-Chalmers Transformers Into State-Wide System

POWER TO RUN machine tools and motors, to move assembly lines . . . power to produce thousands of automobiles each week is supplied by this pair of 10,000 kva Allis-Chalmers transformers. They supply economical power for a large auto manufacturing and assembly plant in Michigan.

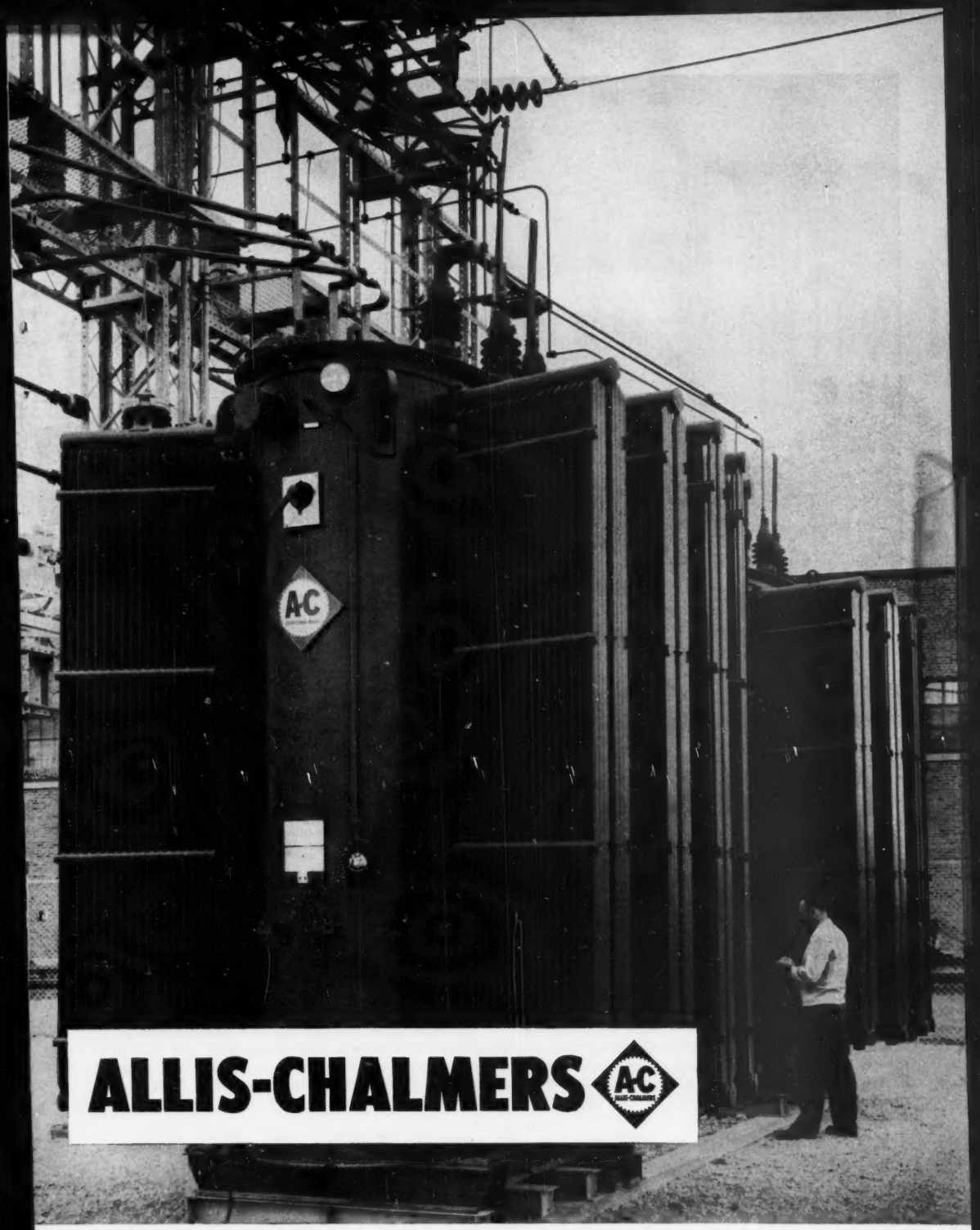
These transformers, installed by Consumers Power Company, are designed to have a low rate of depreciation and low maintenance cost. For over a quarter of a century, Allis-Chalmers power and distribution transformers have met the exacting standards of the Consumers Power Company's state-wide system that supplies 1,000,000 kw to 56 Michigan counties. These new transformers will help make satisfied customers for years to come.

Because they're equipped with protective inert gas system (which preserves the high dielectric strength of the oil and minimizes filtering requirements) sludge and acid formation is retarded. They're electrically designed for proper stress protection . . . high and low voltage windings, coils and leads are strongly supported and securely braced against repeated short circuits. Specially designed radiator gaskets eliminate leakage.

These are just some of the reasons why Allis-Chalmers transformers are doing a good job of power distribution for the nation's progressive electric power producers like Consumers Power Company. Whether standard or special designs, Allis-Chalmers can produce the specific transformer for your system.

Why not call in your A-C sales representative for more information on Allis-Chalmers power transformers? Offices in 64 principal cities. Allis-Chalmers, Milwaukee 1, Wis.

A-3387



Two 10,000 kva 3 phase, 60 cycle, 55° C rise, positive pressure inert gas equipped outdoor transformers installed by Consumers Power Company at Pontiac substation. Soon to be added is a 30,000 kva Allis-Chalmers power transformer at Erie.

Doorway to opportunity for you

GENERAL ELECTRIC'S Home Light-Conditioning Program is now underway in a *big* way!

Already, 88 electric service companies are tying in with the program. Nearly 2 million Light-Conditioning recipe books have been distributed. And millions of people have been reading General Electric's national advertising campaign on Light-Conditioning. Now is the time for *every* electric service company to tie in and make the most of the opportunities in Light-Conditioning!

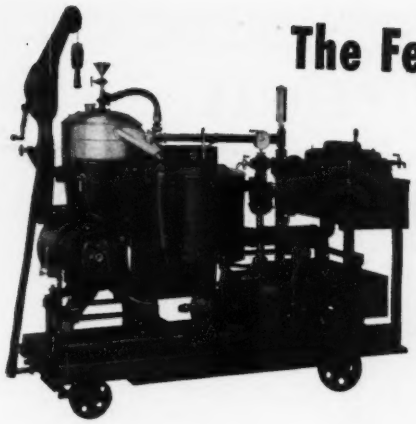
With General Electric Light-Conditioning, your customers have the kind of lighting that's been proved best by top-ranking lighting experts. It shows, in recipe form, the right lamps to use, the right fixtures to use them in, the right location for the fixtures.

Light-Conditioning brings home lighting into new importance. It gives you a rallying point around which to concentrate your efforts in improving lighting standards. Since Light-Conditioning is basically a program for conserving eyesight and bettering the beauty and comfort of people's homes, it offers tremendous public relations possibilities.

To learn how you can get a Light-Conditioning program underway in your service area, call your G-E Lamp District Office, or write Lamp Department, General Electric, Division 166-EW-5, Nela Park, Cleveland 12, Ohio.

You can put your confidence in—

GENERAL ELECTRIC



The Features of a DE LAVAL PORTABLE OUTFIT Insure Safe and Economical Oil Purification

ADVANTAGES OF DE LAVAL PORTABLE OUTFIT	WHAT THEY MEAN TO THE POWER ENGINEER
✓ A De Laval Portable Outfit operates at constant high purifying efficiency. It need not be shut down during a run for renewal of essential parts.	✓ A greater output of dehydrated insulating oil obtained at maximum operating economy.
✓ A De Laval Portable Outfit dehydrates at a single pass.	✓ No re-running is necessary, saving time and money.
✓ The De Laval centrifuge continuously discharges all water that is removed from the oil.	✓ No possible recontamination of the purified oil by removed water.
✓ Purification is carried out at safely low temperatures. The heater cannot carbonize the oil.	✓ High dielectric value of the oil maintained longer.
✓ Purifier has a very high daily capacity.	✓ Reduces cost of insulating oil purification.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL

INSULATING OIL PURIFIERS

NEWS ABOUT PEOPLE

Georgia Power Promotes Oliver, McDonough; Brodnax Named VP

J. M. OLIVER

J. J. McDONOUGH

Georgia Power Co has made several changes in its executive staff. J. M. Oliver, vice president in charge of operation, has been named vice president and general manager, a position which has been vacant since the election of Harllee Branch as president. J. J. McDonough, vice president and manager of the Atlanta division, has been appointed executive vice president, a newly created post. Replacing McDonough as manager of the Atlanta division is George H. Brodnax, who also has been named a vice president.

Others advanced were C. M. Wallace, Jr, assistant to the vice president in charge of operation, who is now sales manager and assistant to the vice president in charge of sales; and Robert Wardle, Jr, manager of the community development division, who was appointed assistant to the vice president and general manager.

Oliver has been with Georgia Power for more than 23 years. He came to Atlanta as operating manager of the company in 1927 and subsequently was elected vice president in charge of operation. Before joining Georgia Power, he worked for Alabama Power Co.

McDonough came to Georgia Power in 1927 as assistant to the Dublin manager and later held supervisory and managerial posts in Athens, Brunswick, and Douglas. He became division manager at Rome in 1937 and three years later was made a vice president. Last year he was named division manager at Atlanta.

Starting with Georgia Power in 1925, Brodnax served as steam engineer in the Atlanta division until 1944 when he became assistant to the vice president. He helped organize the Better Home Towns Program for Georgia Power and in 1948 became assistant to the vice president in charge of sales. Before joining the utility, Brodnax worked for Electric Storage Battery Co, Atlanta, Ga.

G. H. BRODNAX

Wallace, who joined Georgia Power as a student engineer in 1928, has served as power salesman and lighting engineer in Athens and division lighting engineer in Atlanta. Last year he was made assistant to the vice president in charge of operation. Wardle has been director of the Better Home Towns and Community Development programs since 1948. He joined the power company in 1934.

•

Ritter, Huggins Elected VPs by Westinghouse

Westinghouse Electric Corp has elected two of its executives to new positions. E. W. Ritter, manager of the company's Electronic Tube Division, has been made a vice president and E. V. Huggins has been appointed to the newly created post of executive vice president of Westinghouse Electric International Co.

Ritter joined Westinghouse a year ago as a consultant on electronic tube design and development. He had been connected with Radio Corporation of America for 17 years and went to Corning Glass Works in 1942. He served as vice president with Corning Glass and later as president of Corning Glass Works of South America.

Huggins has been secretary of Westinghouse for the last three years and headed the company's law department. He joined the company in 1943.

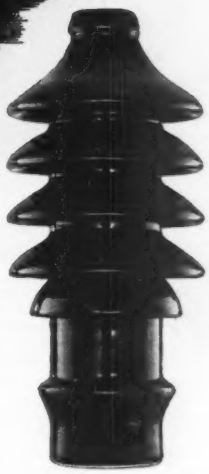
•

Rochester Gas & Electric Promotes Miller, Nichols

Two new officers have been elected by Rochester (N. Y.) Gas & Electric Corp. Paul J. W. Miller has been elected secretary and Harold W. Nichols treasurer. They had been assistant secretary and assistant treasurer respectively and replace Frederick H. Patterson, secretary-treasurer, who has retired.

Miller has been with Rochester Gas & Electric for 37 years, serving in the

THIS IS A POTHEAD PORCELAIN



This isn't a very complicated porcelain shape. It isn't large, compared to many pieces daily going through our kilns. The voltage to be imposed on it isn't great.

Production of a continuing volume of these pieces should be a routine matter for Lapp. It is. And, when we stop to think about it, the fact that we make such a piece routinely well is a source for quite some pride. It isn't everywhere that such uniformity of production of porcelain ware is attained.

This is a housing for a pothead—a spot that requires as high an order of reliability as any place in an electrical system. Electrical and mechanical soundness is essential. Positive sealing in assembly requires accuracy of dimensions.

Such requirements are met only by a thorough understanding of clay and clay handling, and perfection of techniques and controls that bring the best out of this remarkable material. Such as Lapp Vacuum Process, which produces a body of uniformity, and minimizes chances for cracks and internal strain—the Lapp throwing technique, which "works" the clay and refines grain structure, just as forging improves the quality of steel—Lapp dry-turning, which permits close dimensional tolerances—compression glaze, a Lapp accomplishment of many years standing, to provide mechanical ruggedness and to withstand clamping pressures and thermal stresses.

These are the things that have made it possible to supply pothead porcelains to the satisfaction of this one manufacturer for more than 30 years. These are reasons back of the fact that many other users of porcelain find that even a "premium" price for Lapp porcelain is a "bargain" in extra quality and extra performance.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp

and they cost no more than other treated poles

You'll get lots of praise from linemen, installers and trouble-shooters when you start using Penta-protected poles. That's because Penta Preservative treatment is clean—easy on the men who climb the poles.

You can absolutely depend on Penta for protection from insect attack and decay. Even after years of service, you'll find no ground line decay, shell rot, top rot, or insect damage in Penta-treated poles and cross-arms.

That's because PENTAcholorophenol is a powerful, stable and uniform wood preservative —allows measured and positive protection. It's always the same! Penetrates deeply into the wood and will not leach out. Doesn't affect conductivity, ereates no special problems.

Specify PENTA treatment for safeguarding your poles, cross-arms and other wood construction. It costs no more than other commonly used types of preservation. Write us for complete facts and names of companies supplying Penta-treated forest products.

CHAPMAN CHEMICAL COMPANY
333 N. Michigan Ave. • Chicago 1, Illinois
Dermon Building • Memphis 3, Tennessee

CHAPMAN™

Penta Preservative

Conforming to A.W.P.A. Specifications P8-49 and P9-49

auditing and accounting departments.

Entering the utility accounting field 28 years ago, Nichols worked for New York State Electric & Gas Corp before joining the Rochester company in 1930 as auditor. He became assistant treasurer in 1941.

Patterson, with Rochester G&E for 40 years, became assistant auditor in 1913, and assistant comptroller in 1920. In 1932 he was given the additional duties of secretary and nine years later was appointed secretary-treasurer.

•

Allis-Chalmers Names Schweers to Sales Post

Allis-Chalmers Manufacturing Co has named Chester W. Schweers director of sales of its general machinery division.

Joining Allis-Chalmers in 1930, Schweers has been connected with the company's general machinery division sales organization since that time. He started in the company's New Orleans district office as a sales representative. He also has served as manager of the Houston office and manager of the Los Angeles district office. In 1950 he was appointed manager of the New England region, a post he held until his recent appointment.

•

Richard I. Hanford has been named head of the engineering department of Ilg Electric Ventilating Co. He had been in charge of the electrical engineering division, working on motor design. Other appointments in the department include **L. E. Peterson,** head of the research division, **Elmo Larson,** in charge of the electrical division, **Fred E. Drechsel,** in charge of the design division, and **James O. O'Brien,** head of the information division.

William F. Weinreich, former assistant superintendent of machine shops at the Buffalo plant of Worthington Pump & Machinery Corp, has been placed in charge of the corporation's newly acquired Oil City, Pa., plant. (EW, Jan. 22, p 28).

Edward A. Holmberg, manager of Consolidated Edison Co of New York's appliance promotion bureau, has been named manager of the company's advertising department. He succeeds the late Dennis S. Melvin.

"The Most Significant Development Since Edison's Lamp"

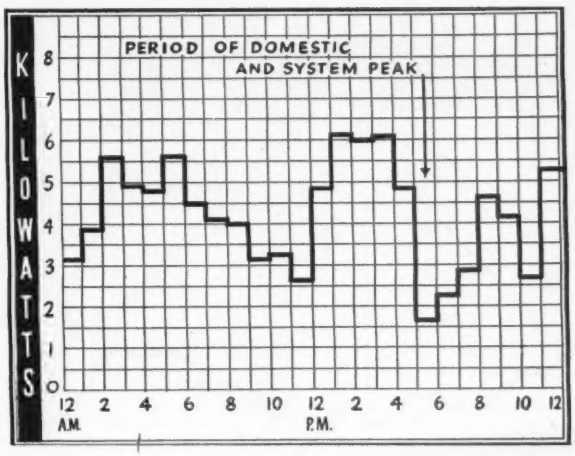
"A statement by a utility executive about 'Glassheat'"

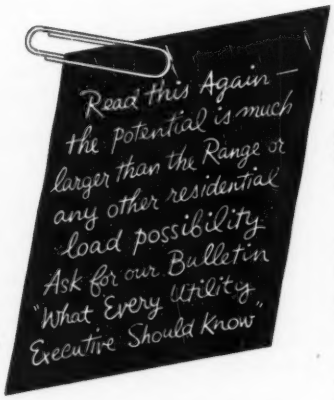
ELECTRIC HEATING with *Glassheat* is CONTROLLABLE — thus PROFITABLE

1. The chart shown is taken from an actual home with "Glassheat" installation in a 6000 Degree Day area on the day of the Utility's Residential peak, which occurred between 5 P.M. and 6 P.M.* on December 24th, Christmas Eve.

2. At this time the demand on the heating circuit was less than 2 kw., yet the design heat loss was equivalent to over 15 kilowatts. Thus, for less than 2 kw. of significant peak demand, over 18000 kw. hours were used on this circuit for heating during the 6000 degree days. The outside temperature at 5-6 P.M. was 26° F. and falling. It was a 37 degree day.

*The 60 minute demand in the hour before control was 4.8 kw. During control it was 1.65 kw. and immediately after control was 2.25 kw. It did not reach the equivalent of demand in the hour before control until 11 P.M., or 5 hours after control was released.





The Public is becoming increasingly conscious of "Living Electrically!" Close cooperation between the Utility Companies and Continental Radiant Glass Heating Corp., can meet the rising public demand, greatly expand the market... thereby developing a source of tremendous PROFIT POTENTIAL.

To develop LOAD CHARACTERISTICS that are profitable to the Utility Organizations—at rates satisfactory to the public—all proposals for the use of "Glassheat" panels must be understood from the Utility viewpoint so that the products are intelligently sold and properly installed.

CONTINENTAL RADIANT GLASS HEATING CORP.—America's Leading Manufacturer of Electric Space-Heating Equipment—works continuously with Utility Companies. Continental can and DOES grasp their particular problems—always ready and able to design "Glassheat" installations with Utility Profits and Consumer Benefits in mind.

Continental's policy of "Controlled Selling of Planned Electric Heating" means BETTER LOAD CHARACTERISTICS—GREATER CUSTOMER SATISFACTION.

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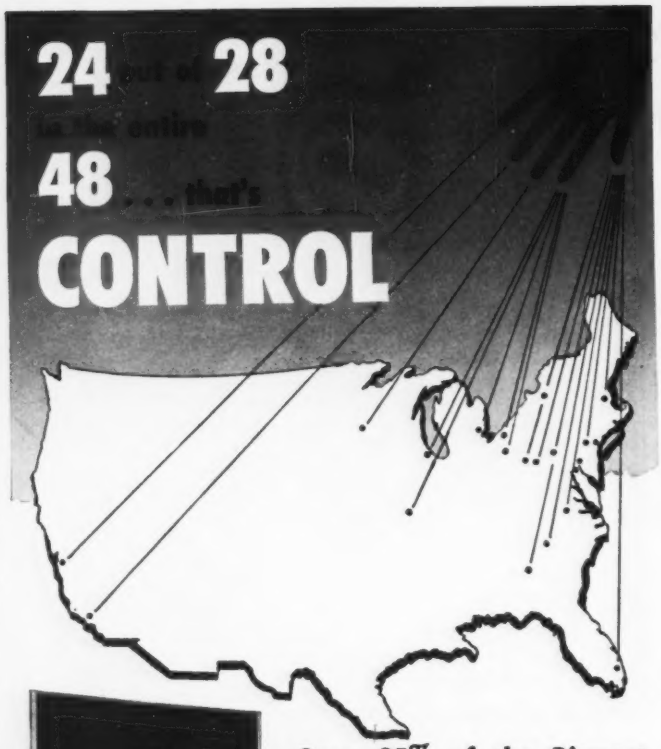

Over 85% of the Biggest Utilities Are Our Customers

Of the 28 utilities with 300,000 or more customers,* 24 or 6/7 of the total are Control Corporation customers. Nearly nine out of every 10 of the big utilities turn to Control for equipment and service. And most of these large companies consistently return to us when their expanding needs call for supervisory control equipment.

*Tabulation from Electrical World News Issue of October 2, 1950.

EXPERIENCE is the most important part of any supervisory control equipment you buy. As specialists, with the willingness to tackle the unusual and difficult, we have acquired an experience background that adds *extra value* to every job we design and build . . . an experience of value to *all* utilities . . . big and near-big.

If you are not already a Control customer, check with us on your supervisory control needs. Our first responsibility is to see that you get exactly what you order. Write today for complete information.

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• Super-Trol • Peak-Trol • Telemetering • Battery Chargers • Carrier Current •

Holmberg has been identified with Con Ed's sales activities for more than 40 years. He started with Brooklyn Edison Co as an office boy and later became a salesman and then district sales manager and sales manager.

Howard N. Walters, general sales manager of British Columbia Electric Co, has been elected president of the Electrical Service League of British Columbia, with headquarters in Vancouver. **Brig Gen W. W. Foster** of the British Columbia Power Commission has been named vice president.

•

Regional Heads Shifted by REA in 2 Divisions

The Rural Electrification Administration has made several changes in the regional head assignments of its Applications and Loans and Management Divisions. Six regions are involved.

In the Applications and Loans Division Harold F. Clark has been shifted from Region II to Region IX. T. Coleman Farrell, formerly head of the Planning and Loan Review Section, replaces Clark as head of Region II. Noble D. Wrinkle has moved from Region V to Region VI, Edgar F. Renshaw from Region VI to Region VIII, and Allan S. Arness from Region IX to Region V.

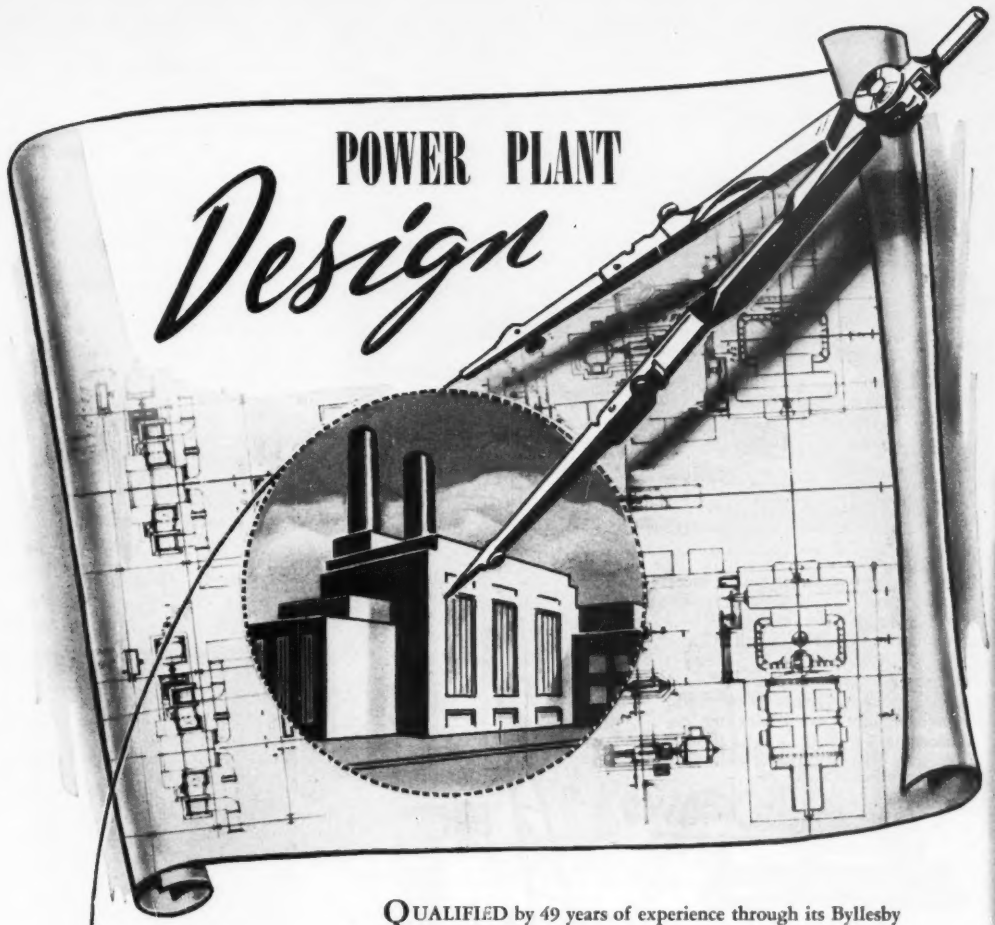
In the Management Division George J. Long was reassigned from Region VI to Region V, Harold A. Whittle from Region V to Region VII, George A. Johnston from Region VII to Region IX, and Russell O. Adams from Region IX to Region VIII.

•

John R. Fennie, member of the sales staff of the Los Angeles plant of Joseph T. Ryerson & Son, Inc, has been appointed manager of the tubular products department. He joined Ryerson in 1946 after having worked for Kaiser Steel Co and Bethlehem Steel Co.

Edwin E. Potter, vice president in charge of contacts and relations with the U. S. Government for the General Electric Co, has received a special certificate for outstanding service in standardization from the American Standards Association.

John D. Carter has been appointed head of Central Hudson Gas & Elec-



QUALIFIED by 49 years of experience through its Byllesby lineage, this now independent organization is contributing over 1,900,000 kw of generating capacity to the national post-war expansion program through its design and consulting engineering services with the collaboration of its purchasing engineers.

In addition, the specialized services offered by the company relieve the management of many periodic or infrequent operations and supplement its staff as to others. These services include—the development and execution of financing plans—advice on accounting and tax matters—stock transfers—dividend disbursement—depreciation and valuation studies—rate analyses and cost allocations—performance analyses—forecasts—reports.

Write for our booklet.

Pioneer Service & Engineering Co.
231 South LaSalle Street • Chicago 4, Illinois

PULL and POWER

Tulsa Winch models for all trucks from ½-ton up.

Tulsa Winches for all crawler tractors complete with transmission, line roller assembly and mounting brackets ready for installation.

Jobs are handled with ease, speed and positive safety with a Tulsa* Winch. To get the most work from your truck or tractor, install a Tulsa Winch. Available in 28 different models in capacities from 6,000 to 80,000 pounds, there is a Tulsa Winch to meet every winching requirement.

PUBLIC UTILITY
Extended drum shaft with easily removable nigger-head. 6,000 to 25,000 lbs. Capacities

*Reg. U. S. Pat. Off.

Tulsa* Winch
TULSA, OKLAHOMA
DIVISION OF VICKERS Inc.

815-49 E. First Street

tric Corp's office of information and will edit the company's bulletin. He succeeds **Winchester H. Heicher,** who has resigned.

Harold Lynch has been appointed assistant superintendent of the Baker River hydroelectric plant of Puget Sound & Light Co near Concrete, Wash. He had been electrician at the plant. He replaces **Art Kramer** who has become advertising director at the company's general office in Seattle.

William Lightfoot has been named general manager of Russell Electric Co, Chicago. He formerly was assistant general manager and before that was associated with the parent company, Raytheon Manufacturing Co, Waltham, Mass.

•

Kelly Named President by Bell Laboratories

Dr Mervin J. Kelly, executive vice president of Bell Telephone Laboratories, New York, has been elected

DR M. J. KELLY

president. He succeeds Dr Oliver E. Buckley who has accepted the post of chairman of the Science Advisory Committee of the Office of Defense Mobilization.

Kelly joined the engineering department of Western Electric Co, subsequently incorporated as Bell Telephone Laboratories, in 1918. He served as director of vacuum tube development for the Laboratories from 1928 to 1934. For the next two years he was director of transmission instruments and electronics. In 1936 he was appointed director of research and eight years later he was named executive vice president.

During World War II, Kelly directed many of the war activities of

From Switchboard Wires to Power Cables... specify U. S. RUBBER

A typical example of "U. S." leadership is Laytex-Neoprene Supervisory Control Cables. In its 19 years of manufacture, not once has a failure of this cable ever been reported. The insulation resistance of these cables actually improves in wet locations!

The small diameter of the Laytex® insulation makes unnecessary the enlargement of cable ducts where signal service is expanding. The Neoprene jacket provides high resistance to abrasion and other abuse, and is highly resistant to oil, flame, and sunlight. The cables are light in weight, easy to install. United States Rubber Company, Electrical Wire and Cable Department, Rockefeller Center, New York 20, N. Y.

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UNITED STATES RUBBER COMPANY

8:30 A.M. Inspector spots trouble and radios for repair crew—right from car.

Track down trouble...faster! with RCA 2-WAY RADIO

8:31 A.M. Dispatcher orders nearest crew to trouble-spot.

8:32 A.M. Truck gets rolling. No lost time. No lost mileage.

8:35 A.M. Repairs start immediately. Service is restored . . . FASTER!

SERVICE TRUCKS can be re-routed immediately to cover emergencies. Aimless driving is eliminated—large reserve fleets are not needed.

Messages can be exchanged between dispatcher and service crews whenever required. Installation . . . and maintenance . . . are accomplished with fewer return trips.

Cable-pulling, wire-laying, pipe-laying can be done faster and co-ordinated easier—through instantaneous communication. Load dispatchers can keep in constant touch with supply sources. Guesswork is eliminated! Outage time reduced! Service speeded!

For the facts about RCA 2-way radio, write Dept. Q-31, RCA Engineering Products, Camden, N. J. *(In Canada, write: RCA Victor Company Limited, Montreal.)*

***Just Out**—new brochure tells how RCA 2-way radio systems can speed operations.*

RCA ENGINEERING PRODUCTS
Dept. Q-31
Camden, New Jersey

Send me the new brochure on RCA 2-way Radio for Industry.

Name_____

Firm_____

Address_____

City_____ State_____

RCA **RADIO CORPORATION of AMERICA**

the Laboratories. He received a Presidential Certificate of Merit for his work.

Buckley had been president of the Laboratories since 1940. He served as director of research of the organization from 1933 to 1936 and was made executive vice president in 1936. Since 1948 he has been a member of the General Advisory Committee of the Atomic Energy Commission. He has been elected chairman of the board of the Laboratories and will continue in this capacity while he serves on the Science Advisory Committee.

•

Thomas Cornils has been named chief engineer for Link-Belt Co's Pacific Northwestern division with headquarters at the company's plant in Seattle, Wash. He succeeds **Homer J. Foye,** now chief engineer at the Los Angeles plant.

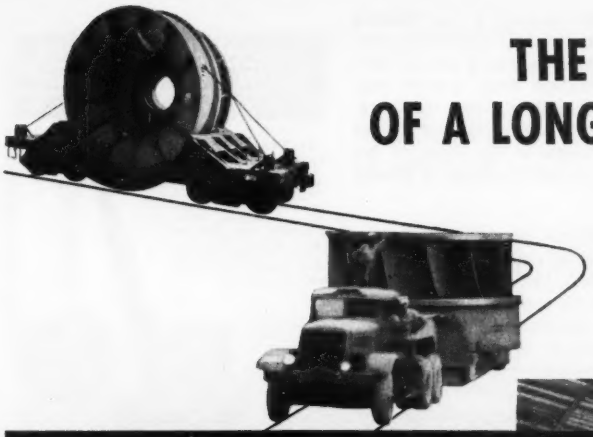
Leopold Van Blerkom has been appointed assistant general sales manager of Tagliabue Instruments Division, Weston Electrical Instrument Corp, Newark. Associated with Tagliabue for 17 years, Blerkom was sales manager for the company's pyrometer and moisture meter lines prior to his new appointment.

Lloyd B. Smith, great-grandson of the founder of the A. O. Smith Corp, has been elected president of the company. Previously he was vice president. He succeeds **William C. Heath** who has been named chief executive officer, a newly created post.

Spencer A. Moore, assistant commercial manager in Newark for Public Service Co of New Jersey, has been appointed assistant manager of power sales at Newark. He will be succeeded by **Stanley L. Chapin.**

D. O. Eschbach has been appointed general sales manager of Roller-Smith and Elpeco. He has been central station sales manager for the past year and a half and previously had been a consulting engineer for Gilbert Associates, Inc, and an engineer in the switchgear division of General Electric Co. He succeeds **R. F. Schall,** who has resigned.

C. W. Lovell, district manager at Beckley, W. Va., for Appalachian Electric Power Co, has been appointed assistant division manager of the com-



THE END OF A LONG JOURNEY— THE START OF A NEW JOB—

AT CENTER HILL NO. 1

Baldwin Turbines

Cradled in a specially designed railroad car . . . trucked on a mammoth trailer—this 170.5 inch, 63 ton Baldwin Turbine Runner came a long way before it was finally lowered into its working position at Center Hill Project, Tennessee. It is one of three Baldwin runners installed. Nominal rating of each is 62,500 H.P. Total generating capacity is 135,000 kw. Operating heads are, Maximum: 207'; Average: 160'; Minimum with full drawdown: 131'. Center Hill is one of 12 projects authorized for construction in the Cumberland River Basin, under direction of the Nashville District, Corps of Engineers, U. S. Army.

• • • •

Baldwin equipment, reinforced with a century of sound, practical engineering experience, has helped to develop some of the world's largest hydro-electric projects. Baldwin turbines cover the entire range from small, fractional horsepower water motors up to the largest units that can be shipped. Units for any head, from highest to lowest, can be provided. And the line includes impulse, propeller, Francis and Kaplan (adjustable blade) types, to suit every requirement.

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BALDWIN-LIMA-HAMILTON CORPORATION
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Widely used on

- Insulator Pins
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- Eliminate checking and re-tightening
- Eliminate radio interference due to loose hardware

Every bolt-and-nut assembly locked with PALNUT Lock Nuts stays tight, despite weather, wind, stress and vibration. PALNUTS, tightened on top of the regular nuts, prevent loosening and falling off. Very low in cost—easily, speedily applied—require little space—may be used on new or existing assemblies. Heavily galvanized by hot dip process to meet A.S.T.M. Specifications. Stocked by all leading pole line hardware manufacturers.

Also used on steel towers, transformers, voltage regulators, disconnects, connectors, bus fittings, etc.

Send details of your needs for PALNUT samples. Write for folder on utility applications.

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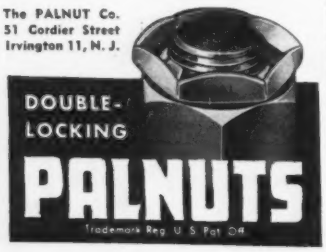


pany. He succeeds **L. A. Wildman** who has joined the engineering division of American Gas & Eelctric Service Corp, New York. Lovell's position at Beckley has been taken over by **Waldo S. LaFon.** In other changes **S. T. Preston,** district manager, has retired and will be replaced by **Chester B. Talley.**

Robert G. Faverty, managing director of Armstrong Whitworth & Co, Pneumatic Tools, Ltd, Newcastle-on-Tyne, England, has been elected a vice president of Independent Pneumatic Tool Co, Aurora, Ill. Faverty became head of the England subsidiary in February and before that had been manager of the parent company's Chicago and Detroit branches.

Carl Miller has been appointed manager of the Clallam County PUD, Chehalis, Wash. He had held a similar position with the Lewis County PUD until recently.

Robert G. Gallup, formerly assistant head of Rural Electrification Administration's power-planning staff, has joined the engineering staff of R. W. Beck & Associates, Seattle.

OBITUARY

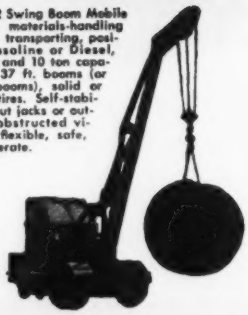
Jesse M. Howell, 66, who retired as manager of General Electric Co's Schenectady Works in 1949, died May 6 at Schenectady. He had been with the company 47 years, starting in the switchboard department. He later served as assistant section head of the cost department, head of turbine costs, and head of the turbine and control cost department. He became chief cost accountant for the works in 1920 and works accountant three years later. In 1937 Howell became assistant to the Schenectady works manager and in 1941 was named works manager.

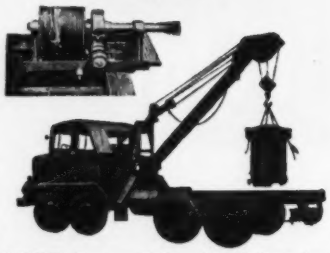
Charles B. Hodgson, 60, retired vice president and manager of Beverly (Mass.) Gas & Electric Co, a New England Electric System subsidiary, died at Wenham, Mass., May 8.

James A. Lytle, cable engineer of Narragansett Electric Co, Providence, R. I., died recently. He joined the company in 1929 after having worked for Duquesne Light Co.

Utilities Have Specified
SILENT HOIST Equipment
• Since 1918 •

KRANE KAR **Swing Boom Mobile Cranes: for materials-handling . . . lifting, transporting, positioning, gasoline or Diesel, 1½, 2½, 5 and 10 ton capacities, 9 to 37 ft. booms (or telescopic booms), solid or pneumatic tires. Self-stabilizing without jacks or outriggers; unobstructed vision; fast, flexible, safe, easy to operate.**





WINCHES: Capstans; Single and Double Drum, Jaw Clutch, Keyed and Friction Clutch Winches. 2,000 to 50,000 lb. Capacities.

SWING BOOM CRANES: Truck: Motor Power Operated; high capacity; takes up only a small space. For handling transformers, cable reels, lamp posts, trees, poles, manhole castings, etc. 9 to 31 ft. booms; one to 10 ton capacities.

TOWERS: 2 or 3 section type and Pantograph types, with plain, revolving or racking platforms.

TRIPOD POLE DERRICKS: for 35 ft., 45 ft., and 60 ft. Poles; single piece or telescopic side legs; removable cast steel fittings.

USERS: AT&T; N. Y. Tel. Co.; T.V.A.; Consolidated Edison Co.; W.U.; Municipalities throughout America.

WRITE FOR CATALOGS:
No. 79—KRANE KAR *No. 70—Truck Equipment*

THE ORIGINAL SWING BOOM MOBILE CRANE WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER
2½, 5, AND 10 TON 3W CAPACITIES
KRANE KAR
TRADE MARK REGISTERED
SILENT HOIST & CRANE CO.
86-7 63rd ST., BROOKLYN 20, NEW YORK

Cables run COOLER...
in TRANSITE DUCTS

... reducing copper losses

... increasing current capacity

... prolonging insulation life

HERE'S HOW to reduce copper losses ... increase current carrying capacity ... and prolong insulation life—run your cables in Transite* Ducts.

Current carrying capacities can be increased in a typical duct bank as much as 5%, or I^2R losses can be reduced 11%, for cables located in Transite as compared with other ducts used for power circuits.

And, Transite Ducts assure permanent duct banks because Transite is incombustible; is immune to rust and rot; is unaffected by electrolysis; will not slag under action of an arc, and will retain its high original strength.

An unusually smooth bore assures no injury to cable sheath, either in natural movement under load, or when pulling-in cables. Long, lightweight lengths can be quickly and economically installed. In addition, a full line of fittings simplifies even the most complicated of installations.

For full information on Transite Ducts, write for Data Book DS-410. Johns-Manville, Box 290, New York 16, N. Y.

*Reg. U. S. Pat. Off.

How Transite Ducts increase current carrying capacities

Type cable 3 cdr. 500 MCM Compack Sector, 15 KV (6th Edition AEIC Spec.)
No. of cables—3 (all loaded in one bank)
Daily Load Factor—75%,
Earth Temp. ambient—20 C

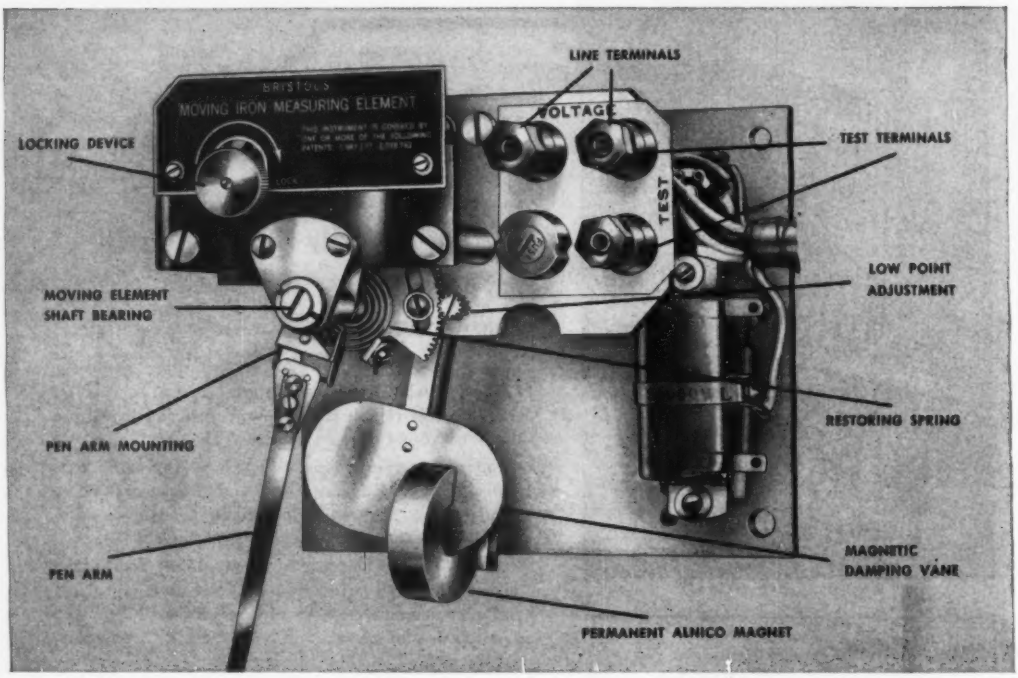
	Transite	Other
Total Therm. Res. to Dielectric Loss (C watts/ft.)	5.66	6.17
Total Therm. Res. to Copper Loss (C watts/ft.)	4.44	4.95
Temp. Rise from Dielectric Loss (C)	1.9	2.1
Allowable Rise for Copper Loss (C)	59.1	58.9
Allowable Watts per ft. cable	4.44	3.96
Allowable Current—(Amps. per cdr.)	386.	365.
Allowable Current—(Relative %)	105.6	100.

Johns-Manville *Transite Ducts* **"KORDUCT"— for encasement in concrete**

"CONDUIT"— for use exposed and underground without encasement

NEW RECORDING VOLTMETERS AND AMMETERS announced by Bristol

Featuring High Torque — Low Burden

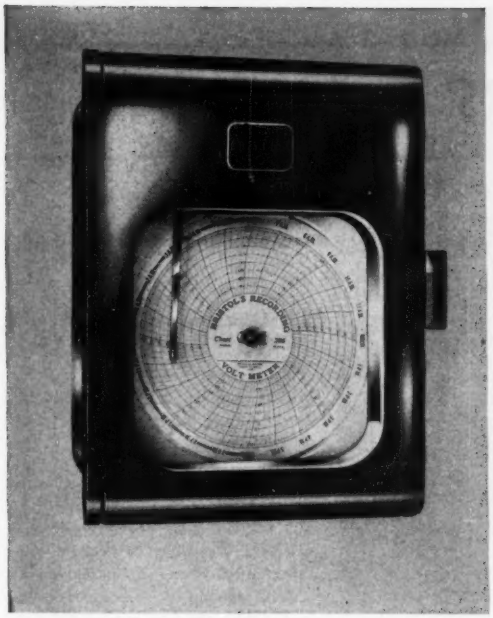


The Latest Development in Electrical Measurement —Outstanding for

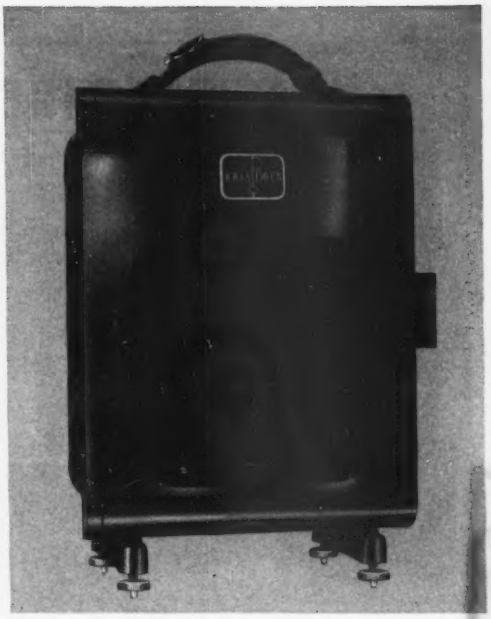
High actuating torque
Low electrical burden
Stability of calibration
Dependable accuracy

THE NEW SERIES 500 RECORDING VOLTMETERS and AMMETERS give you these above features—plus a number of design refinements that make them easier to use and more convenient to service.

The measuring mechanism, for example, is of the moving-iron type—known for high actuating torque and low electrical burden. Bristol-engineered improvements include provision for easy calibration. The rugged construction is your assurance that the accuracy of the original calibration will be retained through the roughest usage. Convenient, accessible locking device protects the measuring mechanism during transit or mishandling. Shock-absorbing stainless steel ball bearings in the measuring mecha-



PERMANENT MOUNTING offered in three models: interchangeable surface and flush, surface-panel, flush-panel. Note the pleasing, well-balanced appearance.



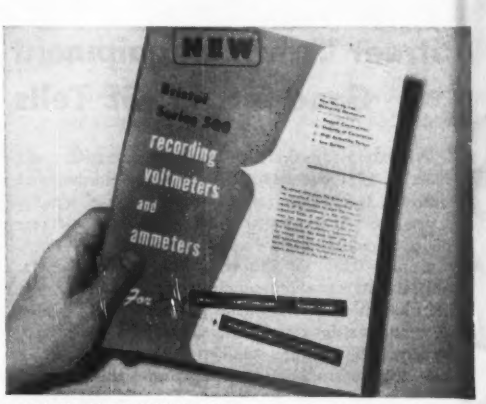
PORTABLE INSTRUMENTS are offered in two models: for setting on floor or table; indoor and outdoor use for mounting on walls or poles and general service.

nism provide further protection. The moving-iron mechanism is sensitive yet extremely rugged.

Other Bristol developments that assure convenience in use include the new Series 500 dust- and moisture-protected die-cast aluminum case, quick-set chart hub for easy chart changing, non-obscuring pen lifter, and snap-on chart plate.

Thus the new Series 500 Recording Voltmeters and Ammeters carry forward a Bristol tradition for design advancement which began nearly 60 years ago. Thousands of Bristol Recording Voltmeters and Ammeters are in use all over the country checking circuit conditions in central stations, sub-stations, and distribution services.

To keep up with the latest in recording electrical instruments, send for Bulletin E1111, addressing THE BRISTOL COMPANY 116 Bristol Road, Waterbury 20, Conn.



FREE 28-PAGE BULLETIN describes latest developments in recording voltmeters and ammeters, gives full information on models, ranges, specifications, and the outstanding new Bristol Moving-Iron Measuring Mechanism.

THE DEPENDABLE GUIDEPOST OF INDUSTRY

BRISTOL

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

MANUFACTURERS and MARKETS

FOUR EXPERTS examine light bulbs at street lighting conference held recently at the General Electric Lighting Institute, Nela Park, Cleveland. They are, left to right, A. L. Pryor, Southern California Edison Co; J. W. Young, New England Power Service Co; and F. D. Crowther and Kirk M. Reid, both of General Electric

Street Lighting Equipment Outlook Good for '51, GE Tells Conference

Availability of street lighting equipment in 1951 equal to 1950 production was the promise of the General Electric Co at its annual street lighting conference at Nela Park, May 8-9.

Despite cuts in allowed use of critical metals, a continuing high level of production is being made possible by economies in use of materials and by elimination of non-standard models, according to Fred M. Spaugh of the West Lynn works.

The essentiality of street and other outdoor lighting in a mobilization economy was pointed out by Fred D. Crowther, chairman of the conference and manager of GE street lighting sales. Crowther said lives and property have been and can be saved by adequate lighting of streets and highways. In 1950, 251 million man-hours, representing enough labor to build 2,400 heavy bombers, were lost through night traffic accidents. Such losses as this, he commented, quite aside from the more important consideration of deaths and personal injuries, make modern street lighting even more significant in this time of national preparation than it was before.

Luther D. Shank, chief of NPA's Building Materials Division, said street lighting was secure in its place as a program supporting the mobilization effort. But, he said, depending on the needs of the military, that position could change tomorrow. He warned it could also change if makers and users of street lighting equipment do not conserve materials, do not use equipment wisely, and do not maintain it properly.

"What about blackouts and coastal dimouts?" was the question posed in a talk by Kirk M. Reid of Nela's engineering division. Reid reported the Navy and the Air Force have prepared directives to this end. Such directives, he said, might be ordered into effect in the event of attack or on threat of attack, or at any time responsible officials decided to use this as a means to spur public interest in the defense effort.

•

1st Quarter of '51 Is Best in Slyvania's History

Sylvania Electric Products, Inc, reported that its net income and sales for the first three months of 1951 were the highest in the company's history.

Net sales in the first quarter totaled $60,631,085, more than double the $29,347,911 listed for the same period last year. Less than 10% of the sales represented defense order deliveries.

Net income for the quarter was $3,515,155, equal to $2.34 a common share, compared with $1,225,844, or 77¢ a share, for the first quarter of 1950. The three month earnings were greater than those for any full year's operations in Sylvania history except 1948 and 1950.

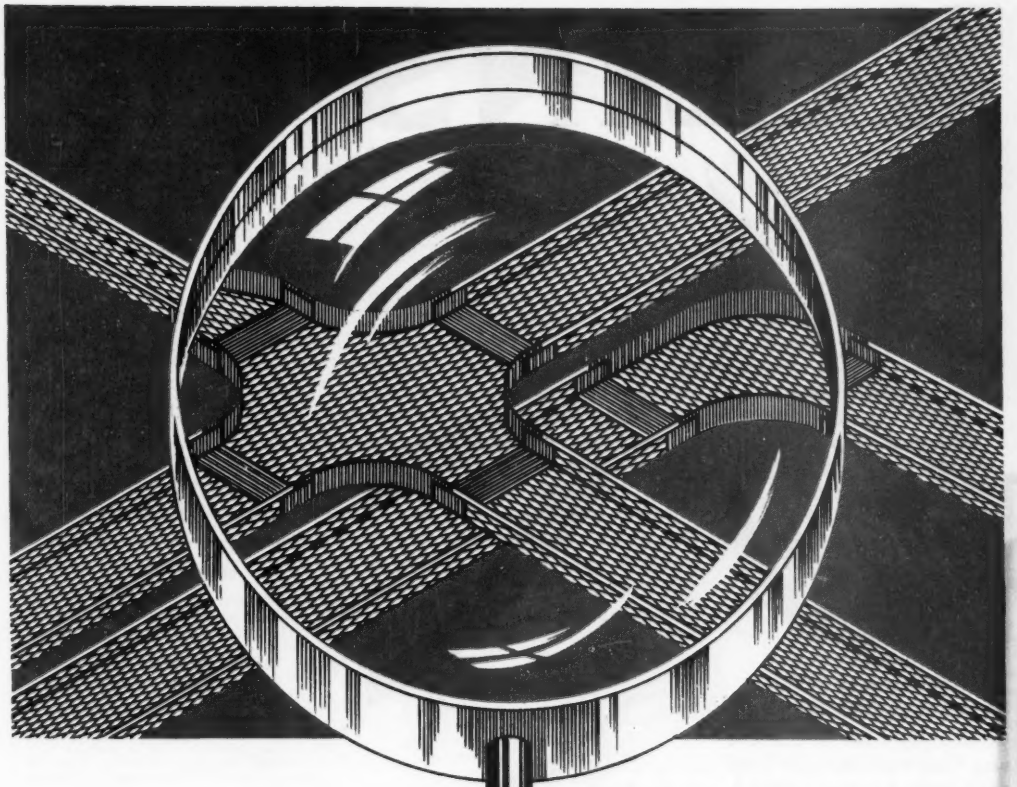
•

Roller-Smith Corp Formed

Realty & Industrial Corp has transferred the business and assets of its Roller-Smith and Elpeco Divisions to the newly formed Roller-Smith Corp. The business will be maintained at its present locations at 1000 N. 8th Ave and 1756 West Market St, Bethlehem, Pa., and 106 E. Walnut St, Allentown, Pa. The company, under the trade names "Roller-Smith" and "Elpeco," will continue to manufacture electrical instruments, switchgear, circuit breakers, and allied products.

MANUFACTURING BRIEFS

International Harvester Co, Chicago, is constructing a new service parts depot and general sales district office and warehouse in Denver. The $1.5-million building will contain approximately 181,000 sq ft of floor space and is expected to be completed by the end of 1952. The service parts



MAN-HOURS CUT

...and Money Saved... With the New System of COPE CABLE TROUGH

To save man-hours in today's Emergency is vitally important. That's why utilities, industrial plants and government agencies have installed the new simplified, versatile and time-saving Cope Cable Trough in preference to using old-fashioned methods of carrying control cables and instrument tubing.

During all stages—from the moment the Design Engineer specifies the use of Cope Cable Trough—during the time it is installed—and at the time the cable is being laid—man-hour after man-hour is saved by using Cope Cable Trough. The Design Engineer can order a complete installation as easily as a pipe system. The men in the field find it simple to install—where necessary, trough can be cut and fitted with a hack-saw—the only installation tools required being a pair of pliers and a wrench. Cable can be easily installed in the trough. And to meet unusual conditions, the Cope Engineering Staff will design special fittings for customers.

Yes! Cope Cable Trough is doing its part in saving —saving labor, saving material and saving costs.

Write today for your copy of the new bulletin on Cope Cable Trough.

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You know Cope by these Products . . .

KLEINS

Top Quality

No. 201-NE

"Since 1857"

When it comes to judging the worth of pliers, ask the man who uses them every day. He'll tell you Kleins—for their hand fit—their proper balance—their carefully matched knives that stay keen longer.

The same top quality that typifies Klein pliers is also characteristic of other Klein tools and equipment—safety straps and belts, climbers, grips and wrenches. Men who know good tools have been choosing Kleins since 1857.

ASK YOUR SUPPLIER

Foreign Distributor:
International Standard Electric Corp.
New York

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If you have not received your copy of the Klein Pocket Tool Guide, write for one. It will be sent to you without obligation.

Since 1857

Mathias KLEIN & Sons
Established 1857
Chicago, Ill., U.S.A.
3200 BELMONT AVENUE, CHICAGO 18 ILLINOIS

depot will serve as a wholesale distribution center for service parts for Harvester motor trucks and farm and industrial power equipment.

The Crosley Division of Avco Manufacturing Corp has cut back its production of refrigerators because of shortages of steel, aluminum, zinc, tin, copper, and other materials. The cutback forced the company to lay off 850 employees at its Richmond, Ind., plant.

Electric Storage Battery Co plans to build a new building at its Crescentville plant in Philadelphia for its engineering department. The building, containing 40,000 sq ft, will be three stories high.

SALES ASSIGNMENTS

COMPANY STAFF

Allis-Chalmers Manufacturing Co has named two sales representatives for its general machinery division. Wayne L. Smith has been assigned to the Denver district office. Melvin L. Scott has been appointed to the Shreveport office where he will specialize in the sale of small pumps.

John A. Roebling's Sons Co, Trenton, N. J., has appointed Walter Whiting Chicago district manager. Whiting, with the company since 1929, has been a salesman in the Oregon territory.

General Electric Lamp Department, Nela Park, Cleveland, has appointed Gomer F. Davis Mohawk sales district manager. He succeeds Dean M. Warren who now heads the department's midwest sales district. His headquarters will be at Albany, N. Y.

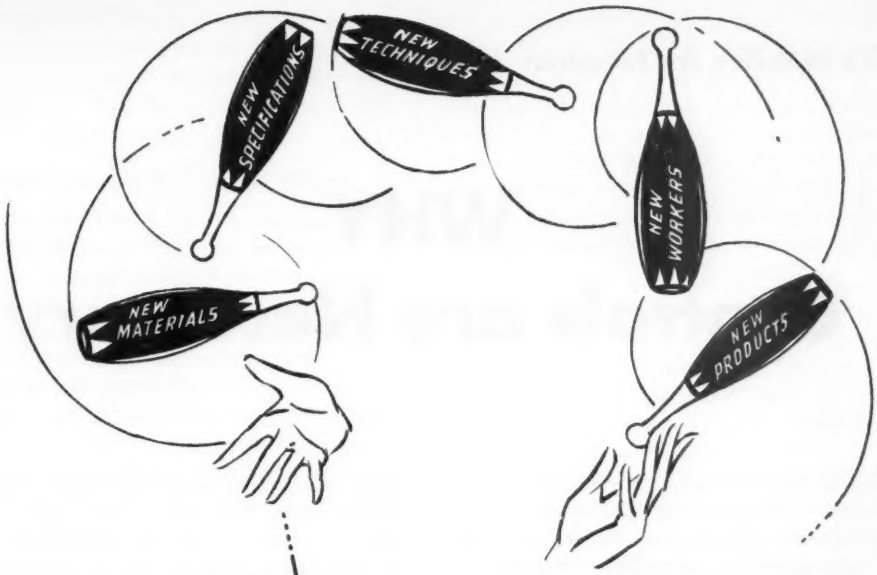
Unistrut Products Co, Chicago, has opened a branch office and warehouse at 188 Hunter St SE, Atlanta, Ga., to serve the southeastern states of Alabama, Georgia, North and South Carolina, Florida, and eastern Tennessee. George Payton has been appointed southeastern district manager by the company.

REPRESENTATIVES

Buchanan Electrical Products Corp, Hillside, N. J., has announced that its midwestern representative, Paul E. Vance, has moved his office to 2226 Transportation Building, 608 South Dearborn St, Chicago 5, Ill.

Metal Prices
May 14, 1951

COPPER, Conn. V., lb	$ .24½
LEAD, N. Y., lb	.17
ZINC, prime Western, E. St. Louis, lb	.17½
TIN, Straits, qual. N. Y., lb	1.39
ALUMINUM, ingot, base price	.19
NICKEL, base price	.50½
STEEL, billets, Pitts., ton	56.00
STEEL, scrap, No. 1 heavy Pitts., ton	45.00



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NEW YORK 21, N. Y.

We Mobilize for Freedom

WHY Controls are Necessary

One of the encouraging characteristics of the American people is their dislike for government controls. This augurs well for the future of their economic and political freedom.

But for the next few years we must not only tolerate but also help to make effective a whole battery of emergency government controls over our economic life. If we fail to do this now the future of that freedom we cherish will be imperilled. It is the purpose of this editorial—the third in a special series—to explain in simple terms why this is so.

After our military victory in World War II, we rushed through a demobilization which cut our military strength to about one-tenth of its wartime peak. Our allies did much the same thing. But the Russians maintained much of their wartime military strength and built up that of their satellites. With prodigious speed we switched from military to civilian production and went on to enjoy a rousing postwar boom—the greatest in our history.

This boom was in vigorous progress when, on June 25 last year, the Russian-sponsored North Korean army attacked South Korea. Our industrial production was rolling along at almost twice its prewar level. We had labor shortages in many key industrial areas. Under the impact of heavy buying all along the line, prices were climbing.

When the North Koreans smashed into South Korea they smashed into our national consciousness this fact: if we want a fair chance to save our national freedom from destruction by Communist aggression, we must race to restore some of the military power we had so speedily written off after World War II. And we must do it with our resources already very fully occupied with a boom in civilian business.

Program Small Compared to World War II

Compared with our military effort in World War II, the mobilization on which we are now embarked is small. At its peak, under present schedules, it will absorb no more than one-fifth of the total national production. During World War II we reached a point when nearly half of our total production went for war-making.

Moreover, our economy now is much bigger and stronger than it was in World War II. During the last decade there has been an increase of about 15 percent in our labor force. Our workers have had the training advantage of steady employment. The capacity of our industrial establishment is two-thirds again as great as it was ten years ago. Since the war no less than $70 billion has been spent to expand and modernize it.

Given time, the industrial giant we have created could pick up in its stride the added load of production for defense that now is con-

templated. But speed is of the very essence. There is little dissent from the proposition that if we are to stand off Russian aggression successfully we have, at the outside, two years in which to get ready.

Controls Needed to Prevent Chaos

These two facts – (1) the necessity for speed in our rearmament program and (2) an economy already stretched taut by a record civilian boom—create the general necessity for government controls. If we simply pile the billions of added defense expenditures authorized since last June on top of the civilian boom, and let it go at that, two destructive developments would follow. There would be a scramble for scarce materials, notably metals, which would create chaos in those markets. And prices would go through the roof.

Our situation during this mobilization is radically different from what it was when we rushed to get ready for World War II. Then we started with an economy that was coming out of a long depression. There was plenty of slack. Even in mid-1941 we still had over 6 million unemployed. Thus it was possible for us to expand war production greatly and also increase civilian living standards before the limits of our productive capacity made extensive controls necessary. But as we begin this new mobilization we find our economy already operating virtually at capacity. This fact is of key importance in understanding why this relatively small defense program so quickly requires the imposition of controls.

The selection and administration of controls thus far has been badly bungled. The threat of price controls, for example, was broadcast so vigorously and for so long that our people were virtually asked to raise prices and thereby do much to defeat the controls. Adequate taxation directed so as to attack inflation at the source and thus give direct price control a chance to operate has not yet been provided.

Indeed, we could readily assemble a long and devastating catalog of the deficiencies of the government's control program. But that would not dispose of the necessity for controls – by priority, by allocation, and, as a stop-gap, by direct prescription of selling prices – if we are to carry out our mobilization successfully. That is the only means by which a clear right of way for defense production can be cut through the highways of trade and commerce now jammed with civilian boom business.

Hope In The Wilson Plan

Since he became Director of Mobilization, Charles E. Wilson has added a new element of order and hopefulness to the mobilization program. He has laid out a plan which, if we are spared all-out war, would do three things by 1953. First, it would produce the weapons needed by our army and our allies to meet an immediate threat. Second, it would create the capacity that would enable us to move at high speed into weapons production for all-out war – if necessary. Third, it would create the additional production capacity that would restore by that date our ability to resume the climb of the American civilian standard of living.

In technical and industrial terms the Wilson Plan seems to be feasible. If it is successfully carried out, we should be able to begin getting rid of controls rapidly by 1953. But to carry out the program successfully, it must now have vigorous support from everyone. That does not mean mere agreement that it is a good plan. It means that we must conform to the controls that are necessary to make the plan work. In developing this support, the business community is in position to exercise crucially important leadership.

As has often happened in our national history, we are confronted by a paradox. We must accept emergency controls for the time being to insure survival of the freedom that they infringe. But, as we do this, we may find some comfort in the reflection that while controls from Washington are hateful, controls from Moscow would be infinitely worse.

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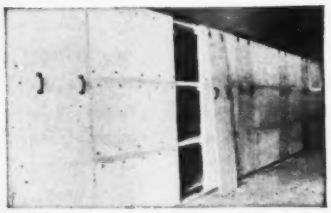
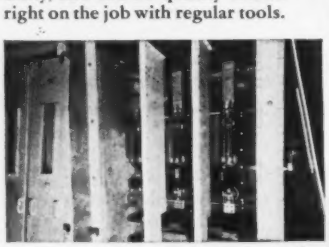
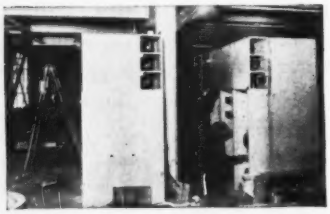
Easier to install—Trancell's light weight and strength make it easy to handle, easy to mount without framework.





Economical to install — Trancell's ease of fabrication and installation keep station expansion and future maintenance costs down.

Safer to install—Trancell is a non-metallic asbestos-base material . . . installed dry. It adequately isolates high-voltage equipment from fire and excessive heat.



Attractive when installed — Trancell makes up into neat, attractive, flush-type housings, panels, doors, and partitions that require no painting.

—for all high voltage power equipment enclosures — Johns-Manville Trancell Materials are made in many sizes and types. Recommended for transformer and switch gear housings and partitions, bus bar enclosures, and other electrical services. For further information write Johns-Manville, Box 290, New York 16, N. Y.

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NEW ELECTRICAL CONSTRUCTION

NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included

UTILITIES

Proposed Construction

Alabama—Cullman Electric Co-operative, Cullman, electric distr. line and sys. imprvs., Cullman Co. **$345,000.**

Calif., Carlsbad—San Diego Gas & Electric Co., 861 6 Ave., San Diego, steam power plant. **$12,000,000.**

Calif., Vacaville—U. S. Eng., Wright Bldg., Sacramento, 2 story radio relay station and steel superstructure, Mt. Vaca Radio Relay Station, near here.

Calif., Yountville—State Div. Architecture, P. Wks. Bldg., Sacramento, underground electrical distr. sys. at Veterans Home.

Colorado—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, one main control board for Beaver Creek sub-station, Colorado-Big Thompson Proj., Spec. 3412. L. N. McClellan, ch. engr.

Ind., Mishawaka—United States Rubber Co., 1230 Ave. of Americas, New York, N. Y., power plant, **$3,000,000.** Boddy-Benjamin Assocs., Inc., 2210 Park Ave., Detroit, Mich., consult. engrs.

Maine—Farm-Home Electric Co-operative, Patten, 16 mi. rural distr. lines, sys. imprvs., Aroostock Co. **$125,000.**

Md., Edgewood—U. S. Eng., 24 St. and Maryland Ave., P. O. Box 1715, Baltimore, Zone 3, rehabilitation 35x35 ft. Refrigerated Bldg. 377-A at Army Chemical Center; Hartford Co., approx. 20 mi. northeast of Baltimore, Eng. 18-020-51-26.

N. Y., New York—Bd. Transportation, 370 Jay St., Brooklyn, Zone 1, furnishing, installing main power equip. for the 74th Street Power Plant.

North Dakota and South Dakota—Bureau Reclamation, Dpt. Interior, Bismarck, N. D., constructing Bismarck-Mobridge-Oahe 230 kilovolt transmission line, Transmission Div., North Dakota-South Dakota, Missouri River Basin Proj., Spec. No. DC-3408.

Oregon—U. S. Eng., 628 Pittock Block, Portland, Zone 5, procurement lighting and power panelboards for Detroit Dam Power House and for Big Cliff Reregulating Dam Power House, Serial No. CIV-ENG 35-026-51-270.

South Dakota — Bureau Reclamation, Dpt. Interior, Bismarck, N. D., construct Fort Randall-Oahe 230 kilovolt transmission line, Transmission Div., Missouri River Basin Proj., between Fort Randall, and Oahe, Spec. No. DC-3409.

South Dakota — Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Huron, oil-immersed, self-cooled, outdoor distr. transformer; outdoor power circuit breakers; single-throw, manually-gang-operated, outdoor disconnecting switches; single throw, manually-gang-operated, outdoor horngap switch; single pole, single throw, hook operated, outdoor disconnecting switches; single-pole, single-throw, hook-operated, outdoor disconnecting fuses, Huron Sub-station, Transmission Div., Missouri River Basin Proj., Inv. No. DS-3422, furnishing, del. f.o.b. cars shipping point, or f.o.b. cars Mount Vernon, oil-immersed, self-cooled, outdoor distribution transformer; outdoor power circuit breakers; single-throw, manually-gang-operated, outdoor disconnecting switches; single-throw, manually gang-operated outdoor horn gap switch; single pole, single-throw, hook operated, outdoor disconnecting switches; single pole, single throw, hook-operated, outdoor disconnecting fuses for Mount Vernon sub-station, Transmission Div., Missouri River Basin Proj. Inv. No. DS-3424, furnishing, del. f.o.b. cars shipping point, or f.o.b. cars Watertown, oil-immersed, self-cooled, outdoor distr. transformer; outdoor power circuit breakers; single-throw, manually gang operated, outdoor disconnecting switches; single-throw, manually-gang-operated, outdoor horn-gap switch; single-pole, single-throw, hook-operated outdoor

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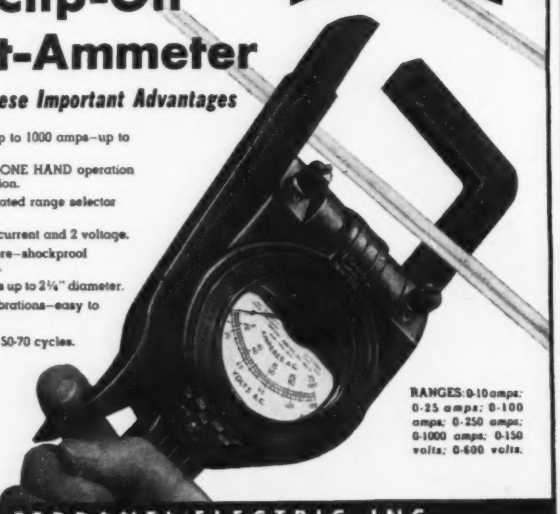

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disconnecting switches; single pole, single-throw, hook operated, outdoor disconnecting fuses for Watertown sub-station, Transmission Div., Missouri River Basin Proj. Inv. No. DS 3423 furnishing, del. f.o.b. cars shipping point or f.o.b. cars Sioux Falls, oil-immersed self-cooled outdoor distribution transformer; outdoor power circuit breakers; single-throw manually gang-operated, outdoor disconnecting switches; manually gang-operated, outdoor horn-gap switch; single-pole, single-throw hook operated, outdoor disconnecting switches; single pole, single throw, hook operated disconnecting fuses for Sioux Falls sub-station, Transmission Div., Missouri River Basin Proj., Inv. No. DS-3421.

Texas—Hunt-Collin Electric Co-operative, Greenville, rural distr. lines, Hunt and Collin Counties. **$162,000.**

Tex., Belton—Rural Electrification Assn., Belton, construct 3rd unit steam electricity generating plant. **$2,000,000.**

Tex., Lackland Air Force Base—U. S. Eng., 606 Santa Fe Bldg., Galveston, electric sub-station expansion, imprvs. **$375,-000.** Beavers-Ashford Corp., Transit Bldg., San Antonio, Tex., consult. engrs.

Washington—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., transformers for Grand Coulee switchyards, Columbia Basin Proj., Spec. DS-3411. L. N. McClellan, ch. engr.

Wyoming—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., transformers for Lovell substation,, Trasmission Div., Missouri River Basin Proj., Spec. DS-3407. L. N. McClellan, ch. engr.

Mexico, Monterrey—C. F. de E. Juarez y Humboldt, Mexico City, plans 15,000 kvt. electric power plant. **$1,750,000.**

Low Bidders & Contracts Awarded

New Mexico, Socorro Co.—Sisco Electric Co., P. O. Box 88, Conroe, Tex. Contract Awarded, **$857,289.** 730 mi. rural distr. line, Socorro Electric Cooperative, Inc., Socorro, N. M. Tynes & Loftin, 345 Korber Bldg., Albuquerque, N. M., engrs.

South Carolina—Roy Richards, Carrollton, Ga. Low Bidder. **$690,170,** Proj. No. IV-A., Sumter Builders, Sumter, S. C., **$568,242,** Proj. IV-B, rural distr. lines. Central Electric Power Assn., Columbia, S. C.

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Proposed Construction

Calif., Atascadero—State Div. Architecture, P. Wks. Bldg., Sacramento, Maximum Security Institute for Dpt. Mental Hygiene on 1,200 acre site. $8,000,000. Plans deposit $200.

Calif., Santa Monica—Rand Research & Development Co., 1500 4 St., plans by H. Roy Kelley, 3722A Wilshire Blvd., Los Angeles, 1 and part 2 story research laboratory. **$12,500,000.**

N. Y., New York—Dpt. P. Wks., Municipal Bldg., Zone 7, Contr. 3, general constr.; Contr. 4, plumbing; Contr. 5, heating, ventilating and refrigeration; Contr. 6, electrical work and lighting fixtures for construction East Harlem General Hospital (Metropolitan Hospital Replacement), 97 to 99 Sts., 1 to 2 Aves., Manhattan Boro. Plans deposit $100.

Pa., Morrisville—HOMES, SHOPPING CENTER, etc.—Danherst Corp., Gordon K. Bolon, R.F.D. No. 2, Langhorne, plans by Richard L. Tully, 582 Oak St., Columbus, O., 3,500 prefabricated and conventional type homes on 1,700 acre tract near U. S. Steel Mill (Fallsington-Hulmeville Rd.) incl. shopping center, community bldgs., schools, churches, WW, and sewage disposal facilities, Falls Twp. **$35,-000,000.** Seward H. Mott, 1737 K St. N.W., Wash., D. C., consult. engr.

Low Bidders & Contracts Awarded

Ill., Chicago—Thorgersen & Ericksen Co., 228 N. La Salle St., Chicago, 1, Ill. Contract Awarded. **$32,000,000.** jet engine assembly PLANT, (2 buildings) office, boiler plant at Willow Springs. Buick Motor Div., General Motors Corp., G. M. Research Bldg., Detroit, Mich. Argonaut Realty Co., c/o owner, archt.

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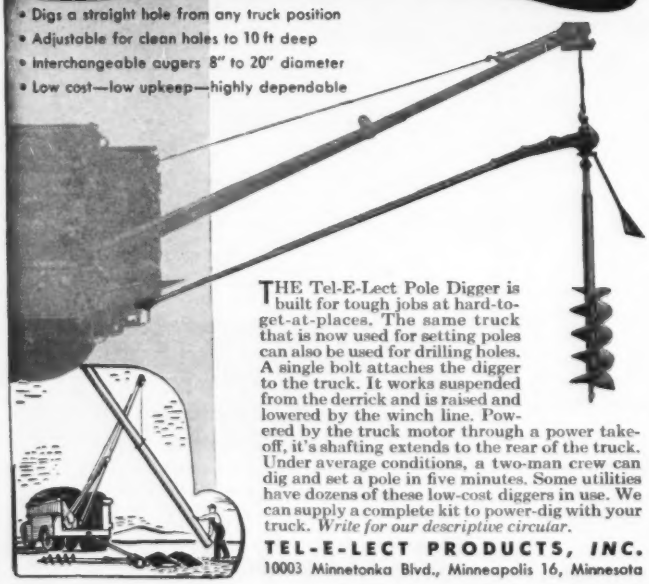

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CATALOGS • BULLETINS

● WOOD PRESERVATIVE: Facts and figures showing the efficiency of copper-arsenate wood treating compound are presented in an illustrated 12-page booklet. J. H. Baxter & Co, 200 Bush St, San Francisco 4, Cal.

● LIQUID LEVEL GAUGES: Instruments for measuring and recording water depth in reservoirs, elevated tanks, rivers, lakes, flumes, and weirs are described in 24-page bulletin (L700). Float, pressure bulb, counterpoise, differential pressure, and air bubbler types for a variety of uses are described. The Bristol Co, Waterbury 20, Conn.

● AIRPORT LIGHTING: Medium intensity airport lighting equipment for small airports and for secondary runways at large airports is described in bulletin 49090. Instructions for installing three systems of marker lights are included. Line Material Co, East Stroudsburg, Pa.

● GENERATORS: Standby, portable, and prime-source power, high-speed synchronous generators in ratings from 1.875 to 50-kva with frequencies of 60 and 400 cycles are described in bulletin GEA-5470. General Electric Co, Schenectady 5, N. Y.

● COMMUNICATIONS: RCA's latest station equipment for two-way mobile radio systems (30-50 mc and 152-174 mc) is described in brochures 2J691, 2J6912, and 2J6926. RCA Engineering Products Dept, Camden, N. J.

● INTERIOR LIGHTING: Proper lighting to create a desired atmosphere is stressed in 16-page bulletin B-5254. Indirect, semi-indirect, direct-indirect, and direct lighting are illustrated. Shielding mediums, lamp sizes, and suspension methods are given for each type, and several suggested uses are offered as a guide in selecting the best type for a particular "seeing task." Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

● INDUCTION HEATERS: Automatic soldering and brazing using high frequency heaters and turntable or conveyor is described in 4-page bulletin available from Sherman Industrial Electronics Co, Belleville, N. J.

● STAINLESS STEEL TUBING: To assist in solving the problem of using straight chromium stainless steel to comply with current restrictions the Babcock & Wilcox Tube Co has published a 4-page bulletin outlining the physical and mechanical characteristics of straight chromium stainless tube steels. Bulletin TDC 140 is available from the company's offices at Beaver Falls, Pa.

● ARTIFICIAL RESPIRATION: A 4-page bulletin (CH-2) describing the Pneolator, a device which makes possible automatic artificial respiration without suction, is available from Mine Safety Appliances Co, Pittsburgh 8, Pa.

● WELDER POWER UNITS: Detailed specifications and performance characteristics of two power units specifically designed for stud welding are described in 4-page bulletin issued by Nelson Stud Welding Division of Morton Gregory Corp, Lorain, Ohio.

● TERMINALS AND CONNECTORS: Pressure terminals and connectors for every type of application on all wire sizes from #26 through 250 MCM are listed in easy-to-find form in 40-page bulletin No. 61 just issued by Thomas E. Betts Co, Elizabeth, N. J.

● AIR COMPRESSOR DRIVES: Information on motor drives for all types of large air compressors is supplied in new issue of E-M Synchronizer No. 32. Tables, charts, and graphs for matching motor

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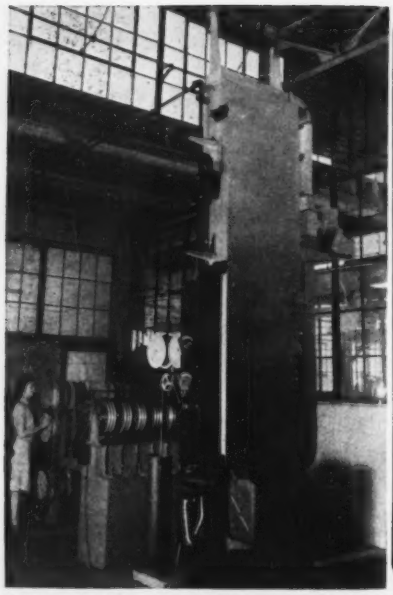

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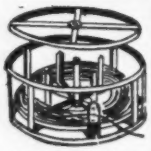
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characteristics to compressor requirements are included. Electric Machinery Mfg. Co, Minneapolis 13, Minn.

● ALUMINIZED STEEL: Data on physical, mechanical, and forming properties, available sizes and gages, as well as detailed recommendations for welding, brazing, and finishing of aluminum coated steel are available from Armco Steel Corp, Middletown, Ohio.

● SWITCHES: Catalog sheet 113.1 describing Outdoor Group Operated Tilting-Insulator Air Switches is available from Pacific Electric Mfg Corp, 5815 Third St, San Francisco 24, Calif.

● GROUND RESISTANCE: Aids to proper instrument selection, application, and typical tests for those engaged in grounding surveys and geophysical prospecting are presented in bulletin 25-9. James G. Biddle Co, 1316 Arch St, Philadelphia 7, Pa.

● ALUMINUM: Facts on aluminum alloys and mill products have been condensed into a 194-page manual which contains tables of data on physical, chemical, and mechanical properties; standard tolerances, weights, fabrication data, etc. Reynolds Metals Co, Louisville, Ky.

● FLEXIBLE PIPE: Amply illustrated, a new 8-page catalog on Johnsonite Plastic Pipe gives information on characteristics of the pipe, its use in diversified industries, chemical resistance, properties, etc. Johnson Plastic Corp, Chagrin Falls, Ohio.

● TECHNICAL DATA: Over 2000 listings of Lefax pocket-sized technical books are contained in a new catalog. Lefax, Philadelphia 7, Pa.

● OIL CIRCUIT RECLOSERS: Step-by-step procedure for maintaining Kyle type single and three phase oil circuit reclosers is given in 12-page bulletin (50025) Line Material Co, Milwaukee, Wis.

● BLAST CLEANING: Typical of application examples included in 4-page bulletin covering portable soft abrasive blast cleaning is illustrated description of cleaning of large motors. Pangborn Corp, Hagerstown, Md.

● DIESEL ELECTRIC SETS: Important design, operating, and performance features of "Caterpillar Diesel Electric Sets" (Form 30059) are presented in 16-page booklet which may be secured from Caterpillar Tractor Co, Peoria 8, Ill.

● LIGHTING: "Planned Lighting for Industry" is comprehensive 47-page publication outlining benefits of good industrial lighting in form of increased efficiency, safety, and morale; improved quality, reduced spoilage, lower costs, and less eyestrain. Lamp Department, General Electric Co, Nela Park, Cleveland 12, Ohio.

● CONTROLS: A 60-page catalog (8304) presenting over 100 different models of nonindicating electric, electronic, and pneumatic controllers for use in industrial applications is available from Minneapolis-Honeywell Regulator Co, Wayne and Windrim Aves, Philadelphia 44, Pa.

● FEED WATER CONTROL: The latest developments in Feed Water Control are described in 16-page bulletin 105-c. A straightforward discussion of problems encountered, diagrams, and photographs of modern installations explain how the Air Operated Three-Element System operates. Bailey Meter Co, 1050 Ivahoe Rd, Cleveland 10, Ohio.

● DC MOTORS AND GENERATORS: A 19-page booklet (B-4595) describing the new Life Line type SK dc motors and generators is available. Mechanical features, enclosures, and mountings for many different applications are pictured. Westinghouse Electric Corp, P. O. Box 2099, Pittsburgh 30, Pa.

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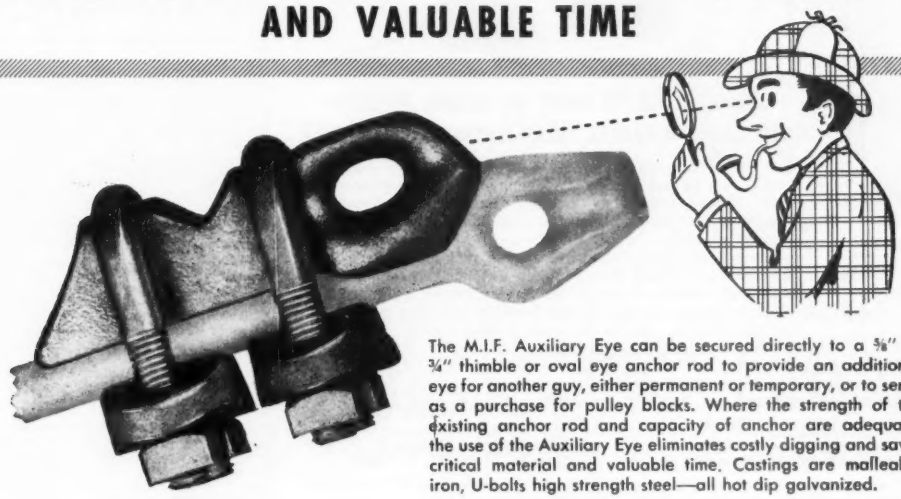

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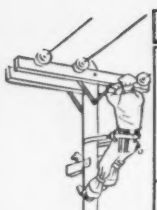

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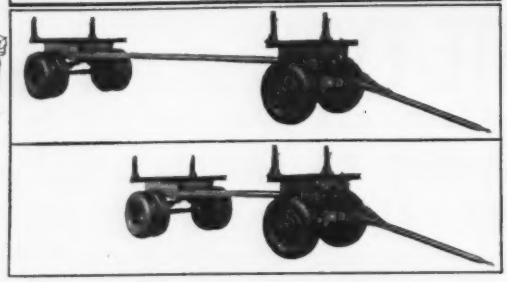

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TECHNICAL LITERATURE

Metal Cleaning—The 1950 supplement to *Metal Cleaning Bibliographical Abstracts* brings up to date original ASTM publication. As in original bibliography, references have been thoroughly indexed. The 32-page 1950 supplement (STP 90-A) is available at $1.00 per copy. American Society For Testing Materials, 1916 Race St, Philadelphia 3, Pa.

Brushes—*An American Standard for Brushes for Electrical Machines*, C 64.1-1950 is a revision of American Standard Carbon, Graphite, and Metal-Graphite Brushes, C 64-1935. The standard contains definitions, dimensions and tolerances, and test procedures needed in the manufacture and use of brushes. Copies may be obtained from the American Standards Association, 70 East 45 Street, New York 17, N. Y.

1950 ASME Transactions—This 1600-page volume contains invaluable fund of information on heat transfer, mechanics and materials, lubrication, fuels, power generation and utilization. Included are 180 articles reflecting experience of 311 authorities. May be ordered for $15 from American Society of Mechanical Engineers, 29 West 39 St, New York 18, N. Y.

Quality Control—*ASTM Manual on Quality Control of Materials* covers presentation of data, limits of uncertainty of an observed average, and control chart method of analysis. Book may be ordered for $1.75 from American Society For Testing Materials, 1916 Race St, Philadelphia 3, Pa.

Motors—*NEMA Standard for Fractional HP Motors* provides practical information concerning rating, dimensions, construction, test, and application. Generally used by electrical industry to promote production economies and to assist users in proper selection of such motors, this publication is available for $2.50 from National Electrical Manufacturers Association, 155 East 44 St., New York 17, N. Y.

Hydraulic Turbines—*Specifying Hydraulic Turbines, Governors, and Accessory Equipment* has been prepared to assist purchasers in preparation of advantageous purchase specifications. Available for 50¢ from National Electrical Manufacturers Association, 155 East 44 St, New York 17, N. Y.

Resistors—*Handbook of Power Resistors* is designed to furnish reader with knowledge of fundamentals, definitions, nomographs, standards, tests, materials, construction, guide for selection, and type classifications of power resistors. The 195-page illustrated book has 20 tables and 15 graphs. It may be obtained for $3 from Ward Leonard Electric Co, Dept 040, Mount Vernon, N. Y.

Metallurgy and Piping—An account of high-temperature materials based on 15 months' operation of the Sewaren Plant of Public Service Electric and Gas Co appears in *Metallurgy and Piping, 1950*, along with a G.E. report on turbine materials. Boiler and piping manufacturers have submitted specifications which are presented in tabular form for use by design engineers. There is also a report on valve outages. Publication 50-10 is available to EEI members for 90¢ from Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y.

Interior Lighting—Booklet B-5254 pertains to commercial interior lighting to create a desired atmosphere. Different types of lighting, lamp sizes, and suspension methods are given for commercial buildings, offices, and schools. Copies are available from Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

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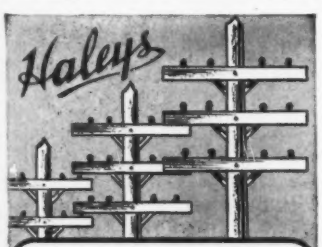

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Battery Additives—National Bureau of Standards Circular 504 is the result of extensive laboratory and field tests conducted on various products being sold to the public for the rejuvenation of storage batteries. This circular contains much information on additives of interest to the average storage battery user. Available for 15¢ from the Government Printing Office, Washington 25, D. C.

Welding—*American Standard for Safety in Electric and Gas Welding and Cutting Operations* covers regulations for the safe installation and operation of welding equipment for all arc, gas, and resistance welding processes. Provisions are included for fire prevention, protection of personnel, welding of materials which may give off toxic fumes, and for welding in confined spaces. Copies are available for 50¢ from the American Welding Society, 33 West 39th St, New York 18, N. Y.

Aircraft Electrical Systems—Pointing out potential displacement of dc by ac in large aircraft, this book presents latest design requirements, maintenance hints, and uses of ac systems. Problems inherent in high altitude operations, ac generators and motors, driving mechanisms, and distribution systems are stressed. *Alternating Current Electrical Systems for Aircraft* (R-1064-A) is available for $1.50 from Westinghouse Corp, P. O. Box 2099, Pittsburgh 30, Pa.

Metering Transformers—Only certain features of CT's used for metering are covered in *AEIC-EEI-NEMA Standards for Metering Current Transformers for Primary Circuits.* Standard No. C57.13 must also be complied with. Terminals and dimensions are given in addition to ratings and insulation class for wound or bar-type transformers. Publication MSJ-3 may be ordered from Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y.

Street Lighting—The following EEI-NEMA Street and Highway Standards are available at 10¢ per copy: (1) *Filament Lamps*, NEMA No. 118-1951; (2) *Photometric Tests for Luminaires*, NEMA No. 119-1951; (c) *Voltage Classification of Luminaires*, NEMA No. 120-1951; (d) *Pendant Luminaire Mounting*, NEMA No. 121-1951; (e) Series Sockets and Series-Socket Receptacles, NEMA No. 123-1951. They may be ordered from National Electrical Manufacturers Association, 155 E. 44th St, New York 17, N. Y.

Watthour Meters—*Manual of Watthour Meters* comprehensively covers fundamentals of ac metering. The 40-page brochure is fully illustrated with charts, diagrams, and photos. It describes operating principles of ac watthour meters, explains their use, and testing and maintenance of meters. Booklet GET-1840 may be requested from General Electric Co, Apparatus Dept, Schenectady 5, N. Y.

Deposits on Steam Generating Units—Sulfur is apparently the principal controlling factor in formation of at least the hard-bonded deposits, and it may have some effect on softening of the ash in the primary and secondary furnaces. This is a conclusion reached by the EEI subcommittee authoring *Deposits on Gas Side of Steam Generating Units.* The report contains statements by some operating companies on their experience with deposits and a general discussion, summary, and conclusions. To EEI members, Publication 50-13 may be ordered for 30¢ from Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y.

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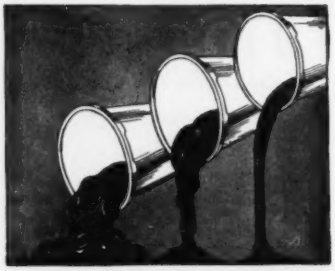

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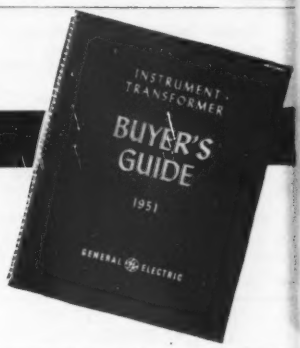

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Measurements

***Electrische Messgeraete*. By P. M. Pflier. Published by Springer-Verlag, Berlin W 35. 193 pages, illustrated. Price DM 21.**

This text considers the scope and the errors encountered in such measurements as those employing dry rectifiers, thermal converters, crossed-coils, iron bound, soft iron ratio techniques, electrostics, vibrating reeds, etc. Description of instruments per se is minimized.

Microwaves

***Waveguide Handbook*. By N. Marcubitz. Published by McGraw-Hill Book Co, Inc, New York 18. 428 pages, illustrated. Price $7.50.**

This is another in the MIT Radiation Laboratory Series. The objective is to translate the problems of microwave fields into network terms for facility in applying orthodox procedures of network analysis and matrices. Treatment is mathematical and understanding will hinge upon correlation with other treatises in the series.

Electronic Pulses

***Pulse Techniques*. By S. Moskowitz and Joseph Racker. Published by Prentice-Hall, Inc, New York 11. 300 pages, illustrated. Price $6.65.**

Analysis of pulses by orthodox frequency methods is both cumbersome and unprecise. This book treats the phenomena of pulses as akin to transients with interposed steady-state periods. The analysis employs the Fourier and Laplacian Transforms but the author leads into their explanation and use for the assistance of those not familiar with them. A power engineer can thereby learn about these relatively new mathematical implementations as well as about the ways of generating, propagating, measuring and applying electric pulses. Of direct interest to microwave users is the section on time-division multiplexing for channel multiplication.

Mathematical Methods

***Mathematical Methods in Electrical Engineering*. By M. B. Reed and G. B. Reed. Published by Harper & Bros, New York 16. 338 pages, illustrated. Price $5.**

Implementation for the solution of the more intricate electrical problems is the aim of this book. Linear equations, determinants, matrix algebra, continued fractions, vector analysis, harmonic analysis, linear differentials, single-mesh network transients, Bessel functions, and complex variables comprise most of the subject matter. The treatment is terse and it will be well for the user to have prior familiarity with determinants, Kirchhoff laws, vector representation, etc.

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U. S. Government

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-3399) will be received by the Bureau of Reclamation, Denver, Colorado, until June 12, 1951, and then publicly opened for furnishing three 60,000-kva, 13,200- to 115,000-volts, 3-phase, oil-immersed, forced-oil-cooled, outdoor power transformers for Folsom Power Plant, Central Valley Project, California. Delivery is desired within 830 to 1,010 days. For particulars, address Bureau of Reclamation, Building 1-A, Denver Federal Center, Denver, Colorado.

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KVA	TYPE	PH	VOLTAGES
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3	3333	West.	132000—7620/13200 Y
1	2000	G. E.	69300—13800/23900 Y, 3 ph.
3	1000	West.	66000—7900
3	200	Mol.	44000/22000—440/220
3	75	G. E.	44000—2300/4600
3	8333	West.	43800—13900
4	6667	G. E.	38100/66000 Y—12700/22000 Y
6	150	G. E.	34500—4600/2300
2	7500	A. C.	33000—13200, 3 ph.
6	200	G. E.	33000—2300/6900
4	150	G. E.	33000—7200/12470
6	75	Mol.	33000/16500—2300/6900
3	75	Weg.	33000—7200/12470 Y
1	7500	G. E.	26400—512, Rectifier type
4	450	A. C.	25410/44000—13200/23000
3	750	West.	13200—440
3	333	G. E.	13200—240/480
3	333	G. E.	11000/22000—2400
3	200	Mol.	11000—2300
3	333	G. E.	4160—240/480
3	250	G. E.	4160—240/480
3	500	G. E.	4000—2300
3	750	G. E.	2400/4160Y—1386/2400 Y Auto
3	200	A. C.	2400—120/240

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1—140 KVA G. E. 200 A. 4000 V. 3 ph.
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6—36 KVA G. E. 150 A. 2400 V.
2—36 KVA G. E. 75/150 A. 4800 V.

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2—600 A. 73 KV G. E. FHKO-139-1000 MVA
1—400 A. 73 KV G. E. FHKO-236- 500 MVA
1—600 A. 37 KV G. E. FHKO-139- 450 MVA
1—400 A. 37 KV G. E. FHKO-236- 500 MVA
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1—	400	Westg.	Non-condensing — 125/150 lbs. I.S.P. 5/10 lbs. B.P.—240/480 v. 3 ph. 60 cy.
1—	300	G.E.	Non-condensing 150/175 I.S.P. 5/10 B.P.—480 v. 3 ph. 60 cy.

SYNCHRONOUS CONDENSERS

	KVA	Make	Type	Volts	Speed
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1—	3000	Whse.		2400/4800	720

MOTOR GENERATOR SETS

3 ph. 60 cy.

Qu	KW	Make	Speed	DC Volts	AC Volts
2—	2000	G.E.	500	686 25 cy.	11000
1—	1800	G.E.	600	125/250	2300/4150
1—	1500	G.E.	360	275	2200/4400
1—	1000	Whse.	900	600	4150
1—	1000	G.E.	900	600	2300/4150
1—	750	G.E.	900	275	4150
1—	750	Whse.	900	275	2300/4150
1—	500	Whse.	900	250	440
1—	500	G.E.	720	125	2300
1—	400	G.E.	720	250	440/2300
1—	350	G.E.	900	125	4150

TRANSFORMERS—60 Cycle

	KVA	Make	Type	Ph	Voltages
2—	4000	G.E.	HT	3	22000x2300
3—	1250	G.E.	HVDDJ	1	6600x550
4—	500	G.E.	HDD	1	22850/13200x480
4—	333	G.E.	HKDD	1	13800/6900x230/460
6—	300	G.E.	HT	3	2400x240/480
8—	300	G.E.	HT	3	13800x240/480

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1200	General Motors	16-278A	1600	720	312	General Motors	8-268A	450	1200
937.5	General Motors	12-567	1080	720	312	Clark	MD-4	376	327
625	Alco	6-12½x13T	750	600	125	Ingersoll Rand	8	225	514
425	Baldwin	VO-6	510	450	187	General Motors	3-268A	150	1200
400	Buckeye	80	480	600	75	General Motors	6043C	90	1200

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1—150 KVA G.E., 3 Ph., 4150V 120/208Y
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LETTERS TO THE EDITOR

The Last Bumper Crop

To the Editor:

Congratulations on your editorial "The Last Bumper Crop—Lost?" which appeared in the April 23 issue.

I do not believe your editorial goes quite far enough, however, as you neglect to mention that any intelligent young graduate, asking a few questions, can find out that in many cases the starting salary offered, such as it is, is only slightly less than that paid to those engineers already in the utility's employ for a number of years. This factor—extremely limited opportunity for financial advancement—has probably lost more recruits and old-timers from the employment rolls than any other . . .

Several of my associates and I formerly worked for utilities. Each of us agrees that, from every standpoint but one, employment by a utility is more desirable than most forms of employment for engineers. The exception is the pay policy. We would have been happy to have continued with our utility employers, but we just could not afford it . . .

Marcus S. Gilbert
3739 North Kenwood St
Indianapolis, Ind.

To the Editor:

Your editorial "The Last Bumper Crop—Lost?" which appeared in the April 23 issue of "Electrical World" has impressed us greatly. So much, in fact, that we would like to distribute copies to several of our department heads . . .

O. S. Hockaday
Supt of Transmission
Texas Electric Service Co
Ft Worth, Texas

To the Editor:

The editorials in the April 23rd issue of "Electrical World" were stimulating as usual. The lead editorial on the coming shortage of young engineers in the utility business aroused my interest the most.

As one of those young engineers who is already in the public utility business and who, after almost three years with this one utility, is seriously thinking of leaving it, may I add some pertinent observations on this problem and on one of its corollaries which was not mentioned?

One point which was not touched upon in the editorial was that the best recruiting activity is that of the recent graduate. The first two or three years after graduation, he is a good source of information to the seniors in college . . . A dissatisfied or uncertain graduate can be a great deterrent . . .

The editorial mentioned the need for modernizing the recruiting story. It did not mention the need for honesty in recruiting, something which should be, but is not, self-evident. Through the recent graduate and/or personal trips to the utility, the potential engineering employee quickly learns whether any of the information he has been given should be discounted . . . that the outlined training program has a peculiar way of . . . being revised to meet the exigencies of a growing business . . .

The starting pay is important . . . The promised schedule of raises, merit or seniority, is just as important. A $5 raise after 6 months sounds good. So does another $5 raise after another 6 months. Then disillusionment sets in. Raises suddenly become yearly in rate. That $160 a year sounds good until it is broken down to $3.08 a week. Meanwhile, the union (which deserves credit for working for its members) gets a 6½% boost . . .

The editorial mentioned, and I quote, "But direct and immediate action along these lines is vital if the industry is to get and hold the pick of the young engineers." That is the only place in the editorial where holding on to young engineers is mentioned. That is a corollary to the problem of getting young men which itself might be worthy of an editorial . . .

Utility engineers are underpaid in comparison with the people with whom they work. A secretary, fresh out of school, can command $40 to $50 a week. The engineer, who must teach her technical spelling, company procedures, etc, is lucky to get $70 a week, after two years on the job. Apparently a four year investment of $8000 of someone's money pays off at the rate of $20 a week . . .

Another important point in keeping young engineers is [the matter of] duties and responsibilities . . . To the veteran who has struggled with red tape in the service, it seems as if he is back in it all over again . . . It is not very invigorating to find that every idea, suggestion, report, etc, must be prepared in multiple form, fed into channels, and allowed to disappear for weeks at a time . . . During hurricanes, earthquakes, boiler explosions, etc, planned emergency procedures must be followed. But in occurrences that are not so great in magnitude, the young engineer is frequently pushed aside by superiors of *his* superior who, acting on their experience and greater knowledge, handle the emergency. The engineers' contribution to all of this is reports.

I mentioned in the beginning that I was thinking of leaving the utility business. Basically, it is because of the pay situation. There are other factors . . . In any event, I do not wish to have the situation forced on me. Therefore, I request that my name be withheld.

A Young Engineer

(Editor's Note: Electrical World departs from its policy of not publishing unsigned letters, in order to air the strong views of "A Young Engineer" regarding employment conditions.)

Inductive Heating Threat?

To the Editor:

Referring to "Brackets Route Generator Cable Cheaply and Simply" page 116, April 9, 1951, "Electrical World," this picture shows the transite ducts secured to backets with U bolts.

Since these are single-phase cable ducts, these U bolts will be subject to inductive heating if made of magnetic material and the cables loaded to near capacity.

For a similar installation at the M. L. Hibbard Station, we used ¼ x 1 in. copper straps instead of U bolts.

George I. Smith
Electrical Supervisor
Minnesota Power & Light Co
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The increased moisture protection stems from the fact that the cover top, being free from drilled openings, is completely drip-proof; no water from leaky pipes, open windows, sprinkler systems, etc., can seep inside the case. The cover comes off easily and quickly by removing bolts which pass through edge of cover into lug. Lugs themselves remain always in place, so that unit can be lifted with cover on or off. A firm, solid lifting structure is obtained by bolting the lugs through the case to the core clamp. Since lugs fit flush beneath overhanging cover, attractive appearance of transformer is maintained.

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